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1st January, 1928.

CONTENTS.

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Agricultural Gazette of New South Wales.

Paspalum Renovation Trials.

RESULTS IN NORTH COAST DISTRICTS.

J. N. WHITTET, H.D.A., Agrostologist

IN view of the need for investigations in the renovation of paspalum pastures, work was instituted at various centres in coastal and adjoining districts in an endeavour to demonstrate the value of certain pasture improvement operations. In each case the area selected was typical of the majority of pasture land in the district, and the paspalum paddocks treated were those where the carrying capacity had been diminishing for some years past.

Paspalum when grown on any area for a long period of years tends to become sod-bound, and the crowns present a thick mat of growth through which rain is unable to penetrate freely. In localities such as the far North Coast, where heavy falls of rain sometimes occur within a few hour[illegible]ost of the moisture runs off this matted growth and the pasture cons[illegible]y suffers. Dairy-farmers are now beginning to realise that ploug[illegible]a-lum pastures is one of the best forms of renovation, as the p[illegible]lop new rooting systems and are able to utilise to the fullest e[illegible] fer-tiliser applied and any rain that falls. Not only does in[illegible]growth result from this operation, but stock show a decided preferen[illegible] ploughed over unploughed sections of a paddock (see Figs. 1 and 2). [illegible] stony land or in paddocks where the tree roots have not been "run" the stump-jump plough can be used with advantage in turning over accessib[illegible] areas.

Top-dressing.

Where it is impossible to plough, the use of fertilisers to increase the growth of grass and encourage seed production and a general thickening up of clover growth has given good results. For ploughed or unploughed paspalum pastures a mixture of superphosphate (2 cwt.), and sulphate of ammonia (½ cwt.) per acre, applied as a top-dressing in August or September of every second year has been shown by these experiments to give very beneficial results. On the red volcanic soils of the Lismore district, however, superphosphate alone, at the rate of 2 cwt. per acre, has produced up to the present time the greatest returns at the lowest cost. In all instances where stock have had access to top-dressed portions of a paddock, they show a decided preference for such sections. This indicates that the stock obtain feed of a more palatable and nutritious nature where the fertiliser was applied. Fertilisers, such as superphosphate, stimulate the growth of grasses and legumes, and increase the mineral matter, especially lime and phosphorus, in these plants. Legumes are the cheapest form in which protein can be supplied to stock. By applying superphosphate to

pastures the growth and seed production of leguminous plants, such as White clover, is encouraged, this being a very essential factor in cases where a rampant grower, such as paspalum, dominates the pasture.

Troubles, such as bone-chewing and rickets, which are altogether too common in coastal districts, are to a large extent due to a general deficiency of mineral matter in the pasturage, and point to the advisability of dairy-farmers endeavouring to increase the nutritive value of their pasture plants by the use of suitable fertilisers for top-dressing purposes. In addition, the licks recommended by the Department's Chief Veterinary Surgeon should be available for the animals. It has been determined by chemical analyses of soil, crops, and pasturage that the predominant need

Fig. 1.—A Paspalum Paddock that was Ploughed April, 1925.

The manner in which this part of the paddock has been eaten down, compared with the part illustrated in Fig. 2, indicates how palatable the new growth was to the cattle. The photograph was taken on 17th August, 1926

in New South Wales, and in fact many parts of Australia, is phosphorous. The reduction of the phosphate content of the soil is evidenced in the case of pastures, by the inferior quality stock found on such areas.

That the failure of plants to produce seed in any quantity may be due to phosphate depletion has been demonstrated repeatedly. In the trial at Mullumbimby it will be seen that an abundance of seed was produced on the superphosphate plot, whereas no seed was formed on the unmanured area. Expenditure on fertiliser would be more than covered by the quantity of seed harvested and sold from such an area, without taking into consideration the extra feed and quality of same produced. To overcome this depletion of the phosphate content of land on which a gross feeder like paspalum is growing, fertilisers such as superphosphate should be used, and beneficial results will accrue not only from maintaining a supply of this important plant nutrient, but also from the thickening-up

of clover growth and the production of better quality pasturage on the area. The general effect of phosphatic manures on coarse and somewhat unpalatable grasses is to render them less fibrous and more succulent.

TABLE A, showing Fertilisers used at different Centres.

District.	Fertilisers used, per acre.												Treatment of Plots prior to Top-dressing.
					Mixture of		Complete Manures. Mixture of			Complete Manures. Mixture of—			
	Sulphate of Ammonia.	Basic Super-phosphate.	P7.*	Super-phosphate	Super-phosphate.	Sulphate of Ammonia	Super-phosphate.	Sulphate of Potash.	Sulphate of Ammonia.	Super-phosphate.	Sulphate of Potash.	Nitrate of Soda.	
	lb.	cwt.	cwt.	cwt.	cwt.	lb.	cwt.	cwt.	lb.	cwt.	cwt.	cwt.	
Murwillumbah ..	..	2	2	2	2	44	2	½	44	...	...	...	One section ploughed, one untreated.
Dunbible ...	56	2	2	2	2	56	...	...	...	...	...	...	No treatment.
Burringbar ..	44	2	2	2	2	44	1	½	44	1	½	½	No treatment.
Mooball ...	44	2	2	2	2	44	1	½	44	1	½	½	No treatment.
Mullumbimby ...	44	2	2	2	2	44	1	½	44	1	½	½	No treatment.
Myocum	44	2	2	2	2	44	1	½	44	1	½	½	No treatment.
Bangalow .	.	2	2	2	2	44	1	½	44	1	½	½	One section ploughed, one untreated.
Cooper's Shoot (Bangalow)	56	2	2	2	2	56	...	..	...	...	...	...	No treatment.
Wollongbar (Lismore).	For details dealing with this centre see next month's *Gazette*												
Coramba ...	44	2	2	2	2	44	1	½	44	1	½	½	No treatment.
Central Bucca .	56	2	2	2	2	56	..	...	...	...	..	...	One section ploughed, one untreated.
North Dorrigo ..	22	1	1	1	1	22	...	...	..	...	...	...	One section ploughed, one untreated.

* P7 consists of equal parts superphosphate and bonedust.

The following mixtures were also tested :—Superphosphate, 2 cwt., and nitrate of soda, ½ cwt. per acre at Murwillumbah; superphosphate, 1 cwt., and sulphate of potash, ½ cwt. on Mr. Neale's property at Bangalow; basic superphosphate, 1 cwt. and nitrate of soda, ¼ cwt., basic superphosphate, 1 cwt. and sulphate of ammonia, 22 lb., and bonedust, 1 cwt. at Dorrigo. Each trial included unmanured plots for purposes of comparison.

Sow Winter Grasses.

A further form of improvement that should be adopted is the sowing of suitable winter grasses and clovers on ploughed or unploughed paspalum country. This practice is being extensively adopted on the Dorrigo plateau and in similar country (see Fig. 12), where, until paspalum became predominant, winter grasses and clovers provided excellent feed and better returns, especially during the colder months of the year, at which period paspalum pastures are practically useless.

If it is possible to do so, ploughing the coastal paspalum pastures in March or April with a mouldboard plough (turning furrows about 6 to 8 inches in width), working the furrows down with disc-harrows, disc-cultivators, or tine harrows, and broadcasting the following mixture of

seed, gives very beneficial results:—Wimmera Rye 2 lb., Italian Rye 2 lb., Perennial Rye 2 lb., Cocksfoot 2 lb., Tall Fescue 2 lb., Subterranean clover 1 lb., White clover 1 lb., Perennial Red clover 1 lb., and Sheep's Burnet 1 lb. per acre. If the soil is friable and deep, add 1 lb. of lucerne seed to the mixture. Cover the seed by harrowing well into the ground. In country where it is impossible to plough, broadcast the following mixture of seed amongst the paspalum during the late autumn:—Wimmera Rye 2 lb., Italian Rye 2 lb., Perennial Rye 2 lb., Subterranean clover 2 lb., White clover 1 lb., and Sheep's Burnet 2 lb. per acre.

As winter grasses and clovers readily respond to superphosphate, resulting in increased growth and seed production, an application of 2 cwt. superphosphate per acre when the plants are well up is recommended.

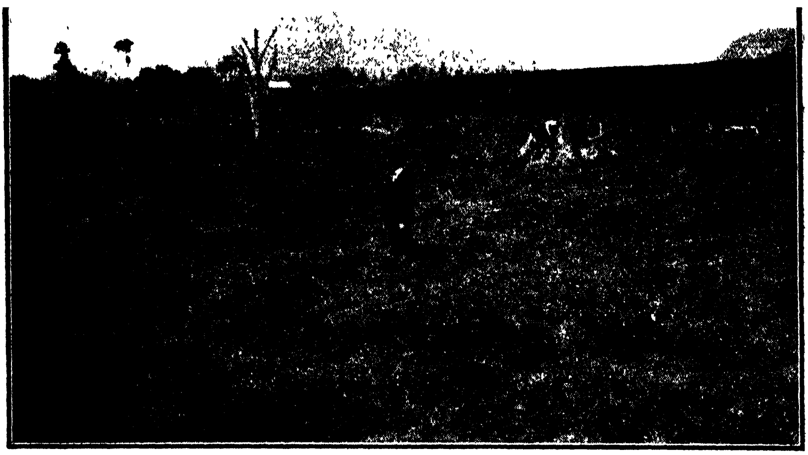

Fig. 2.—Portion of the same Paddock that was not Ploughed.

The cows have practically neglected the unploughed portion of the paddock. This photograph was also taken on 17th August, 1926. Compare with Fig. 1.

Kikuyu grass has been established to advantage on ploughed paspalum sod in renovation trials at Wollongbar Experiment Farm, Lsimore. This rapid-growing, succulent grass pushes its runners out amongst the paspalum and in time chokes out the latter. Kikuyu provides a change of pasturage, and in coastal districts, although primarily a summer grower, it produces more feed during winter months and withstands dry conditions better than paspalum. In cases where it is not desired to sow grasses on the ploughed sod, by broadcasting 1½ to 2 bushels of oats per acre practically no loss of feed is experienced through turning under the grass covering.

Stocking the Trials.

In all of the trials reported below stock had access to the paddocks at periodical intervals, the areas being closed at certain times of the year to allow of sufficient growth being made in order to compare the value of the various treatments.

THE UPPER NORTH COAST.

J. N. WHITTET, H.D.A., Agrostologist, and M. J. E. SQUIRE, H.D.A.,
Agricultural Instructor.

Murwillumbah.

Average annual rainfall for 33 years, 66.29 inches.)

The trial at this centre was located on Mr. W. R. Isaac's property at Boat Harbour road, the soil being a gravelly, clay-loam, greyish to yellowish in colour.

Half of the paddock was mouldboard ploughed in April, 1925, and harrowed twice. With the idea of overcoming the unproductiveness of the land whilst the grass was re-establishing itself, oats were sown and grazed off during the winter. Both the ploughed and unploughed areas were top-dressed on 21st October, 1925, with the fertilisers shown for Murwillumbah in Table A. When inspected on 12th January, 1926, the

Fig. 3.—Untreated and Unploughed Plot, J. B. King's Farm, Dunbible.

grass on the ploughed block was 4 to 5 feet in height, seeding well, and carrying three times the amount of growth of that unploughed. The best plots in each section were those receiving the mixture of superphosphate and sulphate of ammonia, which were 50 per cent. better than the unmanured check plots.

From January to August, 1926, the stock had access to the trial, and observations taken on 17th August, 1926, indicated that the cows had shown a decided preference for the paspalum on the ploughed area, having kept it grazed close to the ground and neglected the unploughed section (see Figs. 1 and 2).

In October, 1926, half of each manured plot was again top-dressed in order to compare areas top-dressed each year with those receiving fertiliser every second year. On 4th May, 1927, only slight increases in growth, ranging from 5 to 10 per cent., were noted where fertiliser was applied each year

as compared with sections where one top-dressing was made to cover two years. The mixture giving the best residual effect was again sulphate of ammonia and superphosphate. The ploughed section still continued to show more and fresher growth than the unploughed, the feed on the latter being somewhat harsh, dry, and yellow in colour, and comparing unfavourably with the former, although the ploughing had been done two years previously.

Dunbible.

(See rainfall for Murwillumbah.)

In the Murwillumbah district an earlier trial was begun in 1924 on old sugar-cane land on Mr. J. B. King's farm. No ploughing was carried out, as it was necessary to select hilly country in order to test the effect of fertilisers on paspalum growing on yellow clay land, this class of country being plentiful in the district. The area had been growing paspalum for twenty-five years, and was badly sod-bound.

Fig. 4.—Top-dressed Pasture on the same Farm.

The pasture on the left was top dressed with sulphate of ammonia and superphosphate; that on the right was top-dressed with basic superphosphate. The fertilisers were applied nearly three years previously, but the residual effect was still in evidence. Compare with Fig. 3.

The fertilisers shown in Table A were applied in November, 1924, and during the first twelve months there was little difference between the sulphate of ammonia plot and that receiving superphosphate and sulphate of ammonia, both being considerably better than the unmanured sections of the paddock. The remaining plots showed very slight improvement over untreated areas. Mr. King stated that the two best plots stood out above the remainder, even as early as a fortnight after the top-dressing was applied.

Half of each manured plot was again top-dressed on 30th September, 1925, the results obtained being similar to those at Murwillumbah, the residual effect from the 1924 applications showing up nearly as well as where the fertiliser was applied both years. An inspection on 17th August, 1926, indicated that the best of the plots were as follows:—Sulphate of ammonia applied during 1924, and in 1924 and 1925, were 50 per cent. and 75 per cent. better, respectively, than the unmanured sections, while the mixture of sulphate of ammonia and superphosphate was superior in each case to sulphate of ammonia alone.

Observations made on 4th May, 1927, nearly three years after the plots received the first application of fertilisers, were to the effect that all treated sections were 10 to 25 per cent. better than the unmanured, thus

showing that the effect of the fertilisers lasts for a number of years (see Figs. 3 and 4). In the case of the two-years' applications (in 1924 and 1925), the residual effects were greater, ranging from 15 to 75 per cent. In each sectional trial the mixture of sulphate of ammonia and superphosphate gave the best results.

Burringbar.

(See rainfall for Murwillumbah.)

The top-dressing trial at this centre was located on a very steep hillside on Mr. F. Grebert's property, the soil being a yellow clay.

Fig. 5.—Top-dressed Plot Grazed Bare.

Fig. 6.—Unmanured Plot Untouched by Stock.

These two plots abutted on a lane, and in the case of the top-dressed pasture the cattle pushed their heads through the wire fence and grazed the pasture bare as far as they could reach. Trial conducted on W. A. Back's farm at Mullumbimby.

Fertilisers were applied on 13th October, 1925, to unploughed paspalum, as shown in Table A, but owing to a heavy storm occurring shortly after the fertiliser was spread, it is possible that a fair proportion was washed into the gullies. When inspected on 13th January, 1926, the superphosphate and sulphate of ammonia plot was showing about 10 per cent. more growth than the unmanured. On 19th August,, 1926, all top-dressed plots were slightly greener than surrounding unmanured areas, although practically no difference in growth was apparent.

Mooball.

(See rainfall for Mullumbimby.)

Top-dressing (see Table A for fertilisers used) was carried out on Mr. W. E. Richen's farm on 13th October, 1925, on unploughed paspalum growing on low-lying, black, sandy soil. This area is close to the coast and becomes inundated by brackish water for short periods during heavy storms.

On 13th January, 1926, sulphate of ammonia, superphosphate, and basic superphosphate plots were each carrying 25 per cent. more feed than the unmanured area, whereas the section top-dressed with the mixture of superphoshate and sulphate of ammonia was 50 per cent. better than the untreated plot. In August, 1926, similar conditions prevailed to those already mentioned. The trial was then discontinued, as the paddock was required for cultivation.

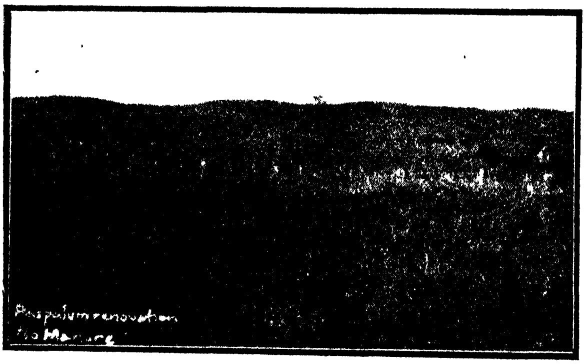

Fig. 7.—Unmanured and Unploughed Plot on J. McGregor's Farm at Myocum

Mullumbimby.

(Average annual rainfall for 28 years, 62.78 inches.)

The trial at this centre was conducted on Mr. W. A. Back's farm, on heavy yellow-clay land, typical of the flat country in this district. The pasture was unploughed paspalum, and fertilisers were applied in December, 1925, as shown in Table A. Here again superphosphate and sulphate of ammonia gave the best result. When seen on 19th August, 1926, this plot was carrying twice as much feed as the unmanured. In order of merit the best of the other plots ranged as follows:—Superphosphate; P7; complete manure containing sulphate of ammonia; basic superphosphate; and the other complete manure.

Prior to this period, Mr. Back had harvested an excellent quantity of heavy paspalum seed from the top-dressed plots, whereas the remaining unmanured portion of the paddock (approximately two-thirds of the area) did not form seed. Most seed was obtained from the section receiving 2 cwt. superphosphate per acre.

The preference that stock show for top-dressed pastures was strikingly illustrated at this centre. One end of the plots abutted on a lane along which the cows travelled, and the grass on the plots receiving fertiliser was cropped close to the ground as far as the cows could reach by pushing their heads in between the fence wires. On the other hand, the unmanured plots and areas in the same paddock and on the other side of the lane were untouched. These facts were recorded and photographed during 1926 and again in May, 1927 (see Figs. 5 and 6).

In order to compare the residual effect of the 1925 application with sections receiving fertiliser in two successive years, half of each plot was top-dressed again in September, 1926. From the two years' treatment slight increases of 10 and 25 per cent. resulted over the 1925 application

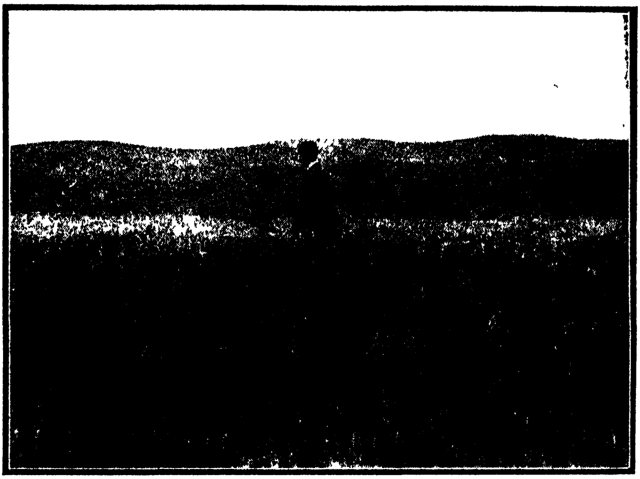

Fig. 8.—Pasture Top-dressed with Superphosphate and Sulphate of Ammonia on J. McGregor's farm. Note the increased growth as compared with Fig. 7.

in the case of superphosphate, and superphosphate plus sulphate of ammonia dressings, respectively. The plot to which superphosphate and sulphate of ammonia was applied in 1925, was showing 50 per cent. more growth in May, 1927, than the unmanured plots. Mr. Back noted that during the periods the stock were on the paddock they ate the top-dressed section in preference to the 2 acres that did not receive fertiliser.

Myocum.

(See rainfall for Mullumbimby.)

In this locality the trial was located on unploughed pasture on Mr. J. McGregor's property. The soil was a chocolate-coloured loam and the country slightly undulating.

Top-dressings were applied on 14th October, 1925, the fertilisers used being as shown in Table A. When inspected on 14th January, 1926, the sulphate of ammonia plot was carrying 25 per cent. more feed than the

unmanured. The mixture of sulphate of ammonia and superphosphate was 50 per cent. better than the untreated plot. The remaining plots were from 10 to 20 per cent. better than the untreated sections, and in order of merit ranged as follows:—Superphosphate; P7; complete manure containing sulphate of ammonia; basic superphosphate; and the other complete manure. Observations made on 19th August, 1926, showed that the superphosphate and sulphate of ammonia plot was carrying twice the amount of feed to be found on that unmanured (see Figs. 7 and 8). The next best plots were superphosphate; basic superphosphate; and then the complete manure containing sulphate of ammonia.

At this time, in viewing the trial, it was carrying, as a whole, 75 per cent. more feed than the surrounding unmanured areas located in the same paddock.

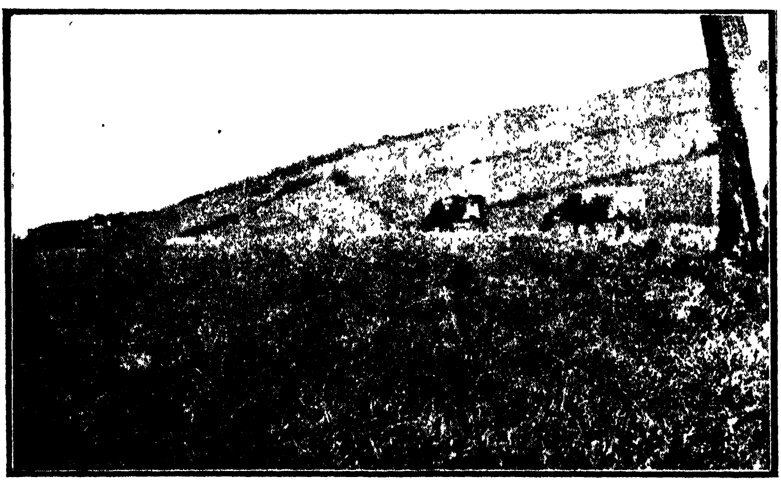

Fig. 9.—Showing Growth on Ploughed Paspalum Trial.
This illustration gives a general view of G. Neale's property, "Fairfield," Bangalow, and shows the hilly nature of the country.

In October, 1926, half of each manured plot was again top-dressed; the increases, however, from the two-years' treatment were on 5th May, 1927, only showing up from 10 to 25 per cent. better than the 1925 applications.

During the periods in which the stock had access to the trials they showed a preference for the sections receiving superphosphate. This was particularly noticeable during 1926, as the animals ate down the superphosphate and sulphate of ammonia plot much more readily than that to which sulphate of ammonia alone had been applied.

Bangalow.

(Average annual rainfall at Byron Bay 34 years, 76.51 inches.)

Two experiments were located in this district, one commenced in the spring of 1924 on Mr. T. Armstrong's farm at Cooper's Shoot, and the other twelve months later with Mr. G. Neale, of Fairfield, Bangalow. The

trial at Cooper's Shoot was unploughed and located on a stony hillside, the soil being a friable, red, volcanic loam (see Table A for fertilisers used). During 1925 the plot top-dressed with superphosphate and sulphate of ammonia produced the most satisfactory growth. On 1st October, 1925, half of each manured plot was again top-dressed, the remaining half being left to test the residual effect of the fertilisers.

When inspected on 14th January, 1926, the plot receiving sulphate of ammonia in 1924 was 50 per cent. better than the unmanured area, whereas the section receiving applications of this fertiliser in 1924 and 1925 showed 100 per cent. more growth. Similar results were obtained from the mixture of superphosphate and sulphate of ammonia. When seen seven months later, the 1924 and 1925 applications of the latter mixture were similar to that used in 1924, and 75 per cent. better than the unmanured plot, thus

Fig. 10.—Unploughed but Top-dressed Pasture at Central Bucca.
Note how the area has been closely cropped as compared with the unploughed and unmanured area shown in Fig. 11.

showing that the residual effect of the fertiliser is apparent for a number of years. Of the other fertilisers, superphosphate, P7, basic superphosphate, and sulphate of ammonia were, in that order, slightly inferior to the mixture of superphosphate and sulphate of ammonia.

The trials at Fairfield were on ploughed as well as unploughed pasture, the soil being a friable, red, volcanic loam. The former was on a somewhat steep hillside, the ploughing being done in January, 1925, and Saccaline sorghum seed broadcasted over the area. This crop was cut later for winter feed. The plots were top-dressed on 2nd October, 1925 (see Table A), and on 14th January, 1926, the ploughed paddock, including the unmanured section, was carrying an abundance of feed and four times as much as surrounding unploughed pasture, an excellent demonstration of the value of ploughing as a means of renovation.

As at other centres, the mixture of superphosphate and sulphate of ammonia was showing 50 per cent. more growth on the unploughed trial as compared with the unmanured plot, and was 10 per cent. and 25 per cent.

better, respectively, than the two next best treatments, *i.e.*, superphosphate, and P7. These differences were still in evidence seven months later on both ploughed and unploughed trials. Mr. Neale's cows were in excellent condition, and milking exceptionally well for this time of the year. He attributed these facts mainly to the excellent succulent growth on his ploughed paspalum pastures, which were carrying soft feed, the broad leaves of the grass being of a dark-green colour, whereas the growth on the surrounding unploughed and unmanured pastures in the district was short and appeared to be more or less harsh when walked on, as well as presenting an unhealthy, yellow-green colour. On 5th May, 1927, the grass on the unploughed area was showing up fresh and green on all plots which had received superphosphate.

The most remarkable feature of this unploughed trial was the excellent growth of White clover on all top-dressed plots at this period. In places the clover was 6 inches high, while on the unmanured plots and in surrounding paddocks no clover growth was present. This valuable result from the October, 1925, top-dressing shows that the residual effect of the fertilisers is apparent for some years later, and effects a general thickening up of clover growth, due mainly to profuse seed setting of this legume.

The ploughed plots, which were located in another paddock that also contained a large area of unploughed pasture, had been grazed close to the ground, and were evidently preferred by the cows to the growth on the unploughed portions. The ploughed and manured plots were fresher than the ploughed and unmanured, and also exhibited a darker green foliage.

LOWER NORTH COAST.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor, and
A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

Central Bucca.

(Average annual rainfall at Coff's Harbour for 26 years, 60.18 inches.)

The old paspalum pasture on which this trial was conducted was on a friable, red, volcanic soil. The experiment was designed to test the value of the following treatments:—

1. Ploughing, with the addition of fertilisers.
2. Ploughing, without the use of fertilisers.
3. Top-dressing, without ploughing.
4. Residual effect of the fertilisers under trial.

Information was also obtained as to the effect of the different treatments on the palatability of the pasture.

Year 1924.—The old paspalum pasture was ploughed in June, and disc harrowed and top-dressed in December (see Table A). The paddock was then closed until the winter to allow observations to be taken on the various plots. During the winter the paddock was grazed by stock.

Year 1925.—Half of each plot top-dressed in December, 1924, was again top-dressed in order to test the residual effect of the previous top-dressing. An addition was made to the trial at this stage, when an area of unploughed pasture was top-dressed with the same fertilisers as used on the ploughed section.

Where ploughing can be carried out it is undoubtedly the most effective means of renovating a worn-out paspalum pasture. Ploughing, with the addition of top-dressing, will give superior results to ploughing alone. It is impossible to plough many paspalum pastures, however, and this experiment proved the value of top-dressing on land where the plough cannot be used.

The following table indicates the estimated increase in amount of feed on the various sections as compared with the untreated pasture and with each other:—

TABLE B, showing Comparative Values of the different Treatments.

Treatment.	Increase over Untreated Pasture.	Increase over Treatment No. 3.	Increase over Treatment No. 2.
1. Ploughed and top-dressed...	8 to 10 times.	5 to 7 times.	3 to 4 times.
2. Ploughed, not top-dressed...	3 to 4 times.	Twice.	....
3. Top-dressed, not ploughed...	Twice.	....	....

The fertilisers that showed out most prominently were a mixture of supherphosphate (2 cwt.) and sulphate of ammonia (½ cwt.) per acre, which was easily the best, and P7 (equal parts superphosphate and bone-dust). Sulphate of ammonia, ½ cwt. per acre, also gave good results. Superphosphate, 2 cwt. per acre, gave a better result than basic superphosphate, 2 cwt. per acre. The plot top-dressed during 1924 gave a substantial increase in growth over the unmanured pasture both in the 1924 and 1925 seasons, the residual effect of the fertilisers being very apparent during 1925. Where the fertilisers were applied during both 1924 and 1925, an increase in growth was obtained from the 1925 top-dressing over the 1924 application, but it did not appear to be large enough to justify the extra cost of the fertiliser, indicating that top-dressing every second or third year would probably be sufficient. Similar results were obtained from the various fertilisers tested on ploughed and unploughed land.

When stock were turned on the paddock for grazing it was found that they preferred the top-dressed sections of the paddock to the unmanured, and the former were eaten bare before they turned their attention to the untreated pasture. A further inspection of this area was made in May, 1927, after the paddock had been stocked for a considerable time. It was found that the top-dressed areas were eaten bare, while the surrounding pasture carried fairly long growth. From this it appears that the quality

of the pasture is improved for several years, as this observation was recorded two and a half years after the original top-dressing was applied. Figs. 10 and 11 illustrate this paddock.

Coramba.

(See rainfall record given for Central Bucca.)

The trial at this centre was conducted on unploughed land, the soil being a yellowish clay loam. Top-dressing the old paspalum pasture was carried out in October, 1925 (see Table A), the area being then closed up from stock in order to note differences in growth on the various plots.

An inspection of the trial in February, 1926, showed great differences between the top-dressed and unmanured plots. On the top-dressed area the paspalum had made greatly increased growth, the colour was good, and thick patches of clover showed up. The two best plots were superphosphate (2 cwt.) and sulphate ammonia (44 lb.) per acre, and P7 (2 cwt. per acre). These plots were estimated to carry about five times as much feed as the

Fig. 11.—Unploughed and Unmanured Pasture at Central Bucca.

Note how the stock have failed to graze this pasture closely. The trial was conducted on Mr. Kennedy's farm.

unmanured pasture. Next in order of merit came superphosphate (2 cwt. per acre), basic superphosphate (2 cwt. per acre), and sulphate of ammonia (44 lb. per acre). The complete manures—(1 cwt. superphosphate, ½ cwt. sulphate of potash, ½ cwt. nitrate of soda per acre), and (1 cwt. superphosphate, ½ cwt. sulphate potash, and 44 lb. sulphate of ammonia per acre)—were not so successful as the above, although they gave an increased growth of about 100 per cent. over the untreated pasture.

In October, 1926, half of each plot was again top-dressed to test the residual effect of the fertilisers. The results were similar to those obtained at Central Bucca.

The partiality of dairy stock for top-dressed pastures was again exemplified by this experiment, the unmanured portions of the paddock being neglected until the top-dressed section had been eaten down.

Dorrigo.

(Average annual rainfall for 11 years, 72.16 inches.)

The experiment at this centre was similar to the one carried out at Central Bucca, top-dressings being applied to ploughed and unploughed areas, as shown in Table A.

Ploughing was done in August, 1925. On the coast it is the practice to plough paspalum pastures in the autumn to allow the winter rains to penetrate to the subsoil more easily and to expose the soil to the beneficial effects of the frosts during the winter. On the Dorrigo plateau

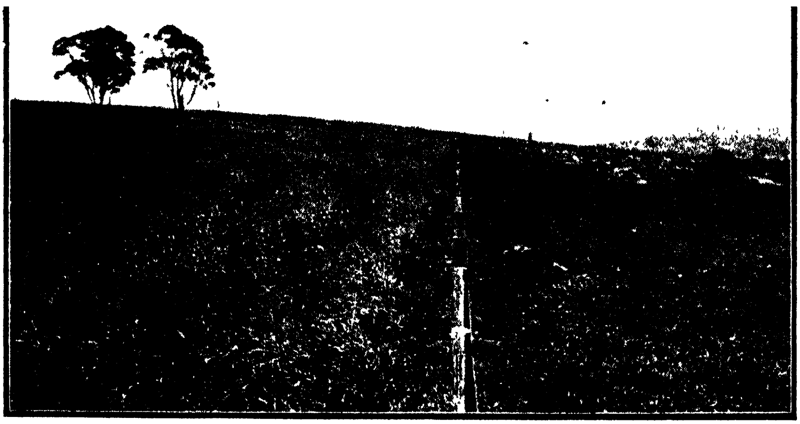

Fig. 12.—Paspalum Renovation Trial on W. A. Parbery's Farm at Dorrigo.
On the left is an excellent growth of winter grasses and clovers, established on ploughed paspalum pasture. On the right is an untreated paspalum pasture.

wet conditions are usually experienced during the autumn, and if a heavy coat of grass is carried at that period ploughing is made very difficult. It has also been noticed that where autumn ploughing is carried out heavy frosts in the winter kill out a big percentage of the paspalum, and an opportunity is given for incorporating winter grasses and clovers on the area (see Fig. 12). If autumn ploughing is carried out and winter grass seed not sown, weeds soon become established. In this trial mouldboard ploughs turning furrows 6 and 8 inches wide were tested on old paspalum pasture. It was found that the 6-inch furrow slice left a more even surface than where an 8-inch furrow slice was cut. When growth commenced the difference was most noticeable. Where the 6-inch plough was used the grass was much earlier and made a more even growth than where the 8-inch plough was worked. The 6-inch plough is, therefore, to be preferred for this work.

Top-dressing was carried out in September, 1925. The results obtained were similar to other centres, the mixture of superphosphate and sulphate of ammonia giving best results. P7 and bonedust also gave good results. Clover growth was particularly good on the top-dressed plots. A notable feature of this trial was that where ploughing was carried out winter grasses, such as Cocksfoot and Rye, were greatly thickened up, and thus a valuable mixture of grasses was obtained. Mr. Parbery states that fifteen years ago, when winter grasses flourished on his property, he was milking sixty cows. At the present time, on paspalum which has choked out the winter grasses, he is only able to carry forty milkers.

SUMMARY.

Where it is possible to do so, ploughing sod-bound paspalum paddocks, applying fertilisers, and planting cover crops or suitable grasses and clovers are the chief forms of renovation which can be adopted.

Beneficial results can be obtained from top-dressing unploughed paspalum land.

In the foregoing trials the fertiliser mixture that gave the best results was superphosphate (2 cwt.) and sulphate of ammonia (½ cwt.) per acre, applied in the spring of every second year.

The residual effect of the fertilisers is often apparent three years after the application is made, but it is considered advisable to top-dress at least every second year.

When the grass sod is turned under the soil is supplied with a large amount of organic matter. Artificial fertilisers produce a greater response where the land is supplied with a liberal quantity of humus, hence the reason for very beneficial results being obtained from the manures when ploughing and top-dressing are carried out.

Top-dressing with phosphatic fertilisers results in a profuse growth of clover, the effect being apparent even two years after the manure is applied. Legumes should be encouraged to spread in paspalum pastures, as they are one of the most satisfactory means of supplying protein to the animals. It is most essential that milking cows in high production receive a sufficiency of protein in their diet.

A rapid-growing, bulky grass, such as paspalum, must in time considerably diminish the fertility of the soil, and to make up for such deficiency the application of fertilisers is necessary.

Stock exhibit a decided preference for treated areas over the ordinary paspalum pastures, as the growth on the former is more palatable, and apparently more nutritious.

NOTE.—Paspalum renovation trials are also being conducted at Wollongbar Experiment Farm, Lismore, and results so far obtained will be reported in the next issue of the *Agricultural Gazette.* An interesting feature of the reports will be the figures showing comparative weights of pasturage harvested from the ploughed, top-dressed, and untreated pastures.

Trials with Wheat and Oats for Hay.

TRANGIE EXPERIMENT FARM.

Summary of Results, 1925-1927.

J. A. WILLIAMSON, H.D.A., Assistant Experimentalist.

FIELD trials with varieties of both wheat and oats for hay have been conducted for a number of years at Trangie Experiment Farm, and a review of the results obtained during the past three seasons may be of interest, especially as regards the performance of new varieties.

Wheat is grown for hay in the Trangie district chiefly as feed for farm horses and as a reserve against droughts. While the hay crops are thus grown with a view to local consumption, the possibility of this district meeting the demands of districts farther west for hay and chaff during seasons of adversity is worthy of consideration. The value of oats on the wheat farm has been constantly stressed, and the practice of feeding oaten hay to farm horses is gradually being adopted. The fact that oats can now be grown successfully even in the drier portions of the wheat area is demonstrated by the results at the Trangie farm during the past three seasons.

Cultural Methods.

The farm soil is a red sandy loam of drift formation, typical of large areas in the surrounding districts. The average annual rainfall is 19 inches, the greater portion of which falls during late autumn and winter. Good falls are generally experienced in the spring; the summers as a rule are dry, although storms are sometimes recorded. The soil is fallowed during the previous season to permit sufficient moisture to be conserved in the soil to meet the crop requirements. The trials are arranged in triplicate, which considerably reduces any error in yield due to variations of the soil.

The following table indicates the rainfall during the growing period in each of the last three seasons:—

	1927.	1926.	1925.
	Points.	Points.	Points.
April	148	172	...
May	22	210	244
June	56	96	758
July	5	54	100
August	114	55	64
September...	180	114	69
October	64	...	35
Totals	589	701	1,270

The sowings for hay are usually completed by the middle of April in order that the haymaking may be completed before the general grain harvest commences. Harvesting for hay takes place early in October.

The wheat varieties are sown at the rate of 71 lb. and the oat varieties at the rate of 66 lb. per acre. Superphosphate at the rate of 50 lb. per acre is sown with both the wheat and oat varieties.

The Wheat Trials.

While early-maturing varieties are essential if profitable yields are to be obtained, the very early maturing varieties do not appear the best suited to the Trangie district. The earlier varieties, such as Early Bird, Firbank, Clarendon, and Florence have, contrary to expectation, yielded less than slightly longer maturing varieties such as Gresley, Waratah, or Bald Early, even in years of light rainfall.

Variety.	1925.	1926	1927.	Average.
	tons. cwt. qr.	tons cwt. qr.	tons. cwt. qr.	tons. cwt. qr.
Waratah	......	3 4 3	1 1 2	......
Bald Early	......	2 16 3	1 0 1	......
Baroota Wonder ...	......	2 19 1	1 0 1	......
Gresley	1 19 1	2 7 1	0 18 0	1 14 2
Firbank...	1 17 3	2 15 1	0 17 2	1 16 3
Clarendon	1 10 2	3 4 2	0 16 2	1 17 0
Early Bird	1 17 1	2 13 3	0 12 2	1 14 2
Florence	1 9 3	2 1 0	0 11 2	1 7 1

Gresley (Federation x Huguenot).—A Western Australian wheat of mid-season maturity; a good hay variety, but liable to be replaced by Waratah or Bald Early.

Early Bird.—The earliest wheat under trial, and of the same breeding as Canberra; resembles the latter in that the straw is weak. Suitable for districts with short growing seasons, but will probably be replaced by varieties with better straw.

Firbank.—A very early maturing hay variety, but more suitable for a mid-season sowing than an early sowing in this district.

Clarendon.—An early-maturing variety, and a better stooler than Firbank. It is more suitable for districts with a shorter growing season.

Florence.—A very early variety of medium height; it has not yielded very satisfactorily on this farm, and appears more suitable for grain in early districts.

The following varieties have only been under trial during the past two years, but are worthy of further trial:—

Waratah (Hudson's Early Purple Straw x Gluyas Early).—This variety has been the heaviest yielder during the past two years, and appears to be one of the best dual-purpose wheats for the west. The drought resistance of this variety, together with the semi-solid nature of its straw, lead to fair yields even in dry years, although it may not be suitable for the Sussex-street market owing to its brown chaff.

Bald Early.—A Victorian selection from Improved Steinwedel, but having a better straw than that wheat; has yielded well for hay at Trangie farm, and is worthy of further trial.

Baroota Wonder.—A farmer's selection from South Australia, having the same season as Comeback. It produces too much flag in a good season to be considered as a standard hay wheat for this district, though it is worthy of further trial.

Oat Variety Trials for Hay.

The following table gives the oaten hay yields for each of the last three years:—

Variety.	1925.			1926.			1927.			Average for three years.		
	tons.	cwt.	qr.	tons.	cwt.	qr.	tons.	cwt.	qr.	tons.	cwt.	qr.
Sunrise	1	19	2	2	12	1	0	14	0	1	15	1
Buddah	2	3	1	2	5	1	0	14	2	1	14	1
Gidgee	2	2	3	2	12	3	0	13	1	1	16	1
Mulga	1	10	1	2	5	0	0	11	2	1	8	3
Fulghum	......			......			0	16	1	......		

The average yields of the oat varieties for the past three years compare very favourably with the average wheat yields over the same period. Owing to their shallow rooting system, oats require a fair spring rainfall for best results.

The results of the trials during the past three years emphasise the value of oats for hay in this district. Thus, despite the fact that little rain (231 points) fell during the first four months of the growing period, yields of practically three-quarters of a ton were obtained from most of the oat varieties during the past harvest.

Sunrise.—An early maturing variety, with tall, medium, coarse straw; requires to be fed off in good years.

Buddah.—The earliest maturing oats under trial. A selection from Sunrise oats. This variety may prove more suitable for silage than for hay. It appears to lose a great deal of weight during the curing.

Gidgee (Algerian x White Logowo x Algerian x White Ligowo).—This variety, which closely resembles Guyra oats in appearance, is worthy of further consideration. Not only does it appear suitable for hay production, but also for grain, a plump brown sample of grain being obtained. A very promising variety, which may rival Sunrise oats for hay and grain in this district.

Fulghum.—An importation from America, which resembles Algerian oats in its young growth, although it is much earlier. The heavy yield (comparatively) obtained from this variety during the past season was the result of heavy rains in late September. It does not appear very drought-resistant, and its reputation for weakness of straw precludes any recommendation of this variety at present.

Mulga.—An early maturing variety which, like Buddah oats, is a selection from Sunrise. This variety has not yielded up to expectations, having been the lowest yielding oat under trial during the last three seasons. Better results may be obtained with this variety for fodder purposes.

Wheat versus Oats for Hay.

The following table shows, side by side, the average yields of the different varieties of wheat and oats:—

Wheat Varieties.	Average Yields, 1925–27.			Oat Varieties.	Average Yields, 1925–27.		
	tons.	cwt.	qr.		tons.	cwt.	qr.
Gresley	1	14	2	Sunrise	1	15	1
Firbank	1	16	3	Buddah	1	14	1
Clarendon	1	17	0	Gidgee	1	16	1
Early Bird	1	14	2	Mulga	1	8	3
Florence	1	7	1				

Red Squill as a Rat Poison.

The Ministry of Agriculture in England advocates the use of red squill poison in baits intended for the destruction of rats and mice, in preference to other stronger poisons sometimes used, such as strychnine, arsenic, and phosphorus. Red squill is particularly recommended for use on farms and in places where, owing to the presence of poultry, livestock, and domestic animals, or stored food supplies, special care is necessary.

Red squill poison is extracted from the red squill bulb (*Urginea maritima*) which grows on the sandy shores of the countries bordering the Mediterranean Sea. It may be used in powdered or liquid form in baits consisting of bread (or oatmeal), fat, syrup, and a few drops of linseed, or in biscuit or other forms supplied by firms who deal in rat destruction preparations and appliances.

Experimental Shipment of Australian Oranges to England.

Interest attaches to an experiment made with a cargo of 235 cases of South Australian oranges, shipped to Great Britain by the "Bendigo." Excluding six cases in various wrappers, which were sent for special investigation to Dr. Barker, of Cambridge University, half of the cargo was carried in cold chambers, and the balance under ordinary cargo conditions between decks, without even a through draught. In appearance and condition there was no difference between the two lots, but on being tasted, those carried in cold store showed a fuller and finer flavour. The wastage was 1½ per cent. on large fruit, and none on the smaller fruit. The results are considered excellent, and were unexpected.—*Imperial Food Journal.*

Rotation of Crops.

H. J. KELLY, Manager, Cowra Experiment Farm.*

THE profitable growing of wheat under present conditions is receiving the serious consideration of farmers. Owing to the increased cost of production, the result of higher land values and of the greatly advanced cost of the necessary plant, higher wages, shorter working days, rates, and taxes, and also the increase of wheat diseases, it is only possible to show a margin of profit by growing good crops.

Improved methods of cultivation, labour-saving machinery, and suitable varieties have done much to make wheat growing less hazardous in the drier districts, but further improvements are necessary to keep the industry on a satisfactory footing, and details require strict attention with a view to ensuring increased production. We find that the average wheat yield for the State varies from 11 to 17 bushels per acre. This can only be regarded as unsatisfactory. There are many good farmers whose yields are constantly above the State average, and with these a margin of profit is secured, but for those whose yields do not reach the average the result must be financial loss on their wheat growing.

Let us then view the matter as it affects the majority of those who are practising mixed farming and who, therefore, do not rely wholly on wheat growing for a livelihood. Very few persons, if any, undertake wheat growing for the love of it, and would decline to turn their attention in some other direction for the improvement of their financial position. The farmer who is running sheep in addition to wheat growing should be anxious to make each section profitable, and each one dependent on the other.

Fat lamb raising is probably the most suitable form of sheep keeping for the wheat grower, as the returns are quicker and the maximum number of sheep is carried for portion of the year only (viz., until the lambs are disposed of), which allows the pastures time to recuperate for future use. To successfully raise fat lambs, however, ample feed of good quality must always be available, and to provide this, fodder crops must be grown. These crops comprise wheat, oats, barley, peas, Sudan grass, and lucerne, and, with a view to the profitable production of wheat and fat lambs, a suitable rotation of these crops can be arranged for most districts within the wheat belt.

Let us take as an example a farm of which the cultivation area is 400 acres, of which 200 acres are cropped each year, the remaining 200 acres being fallowed for the succeeding crop. If wheat growing is the objective, and rotation (other than wheat and fallow) is not recognised, the land will soon become infested with wheat diseases and the returns

* Paper read at Wattamondara branch of the Agricultural Bureau, 8th November, 1927

will diminish until they get below the cost of production. To prevent this it would be better to sow only one-third of the area with wheat, one-third with oats, and to fallow the remaining third for the succeeding wheat crop. Under such a system (as a result of the prevention of the spread of wheat diseases) the returns from the third portion would probably exceed those from the half of the area under the wheat and fallow system. For wheat production this rotation is very satisfactory and secures many of the best yields in the State. For fat lamb raising it has also much to commend it, as for autumn-dropped lambs the wheat and oat crops provide, in normal seasons, a large proportion of the feed necessary to bring them to the marketing stage. The oats can be grazed

	Nº1 BLOCK	Nº2 BLOCK	Nº3 BLOCK	Nº4 BLOCK	
1927		WHEAT	OATS SUDAN	FALLOW	1927
1928		OATS SUDAN	FALLOW	WHEAT	1928
1929		FALLOW	WHEAT	OATS SUDAN	1929
1930	LUCERNE	WHEAT	SUDAN OATS	FALLOW	1930
1931		SUDAN OATS	FALLOW	WHEAT	1931
1932		FALLOW	WHEAT	SUDAN OATS	1932
1933	FALLOW	WHEAT	OATS SUDAN	LUCERNE	1933

Diagram Illustrating a Three-year Rotation.

The diagram is actually worked out for seven years for the purpose of showing how lucerne is introduced into the rotation.

until the end of August without the grain yield being reduced, and by that time the early lambs should be almost forward enough to market, and with the help of the pasture lands, which have been considerably rested by the grazing which the crops have afforded, they could generally be topped off.

Occasionally it may be found that the grazing of the oat crops would have to be extended to a later date to prevent loss in the lamb section, and this might mean a lighter oat crop than usual—possibly none at all, other than that grazed—but, as the crop is put in at a much reduced cost to that entailed in the planting of wheat, the profits gained on the sale of the up-to-standard lambs would probably be ample compensation. The number of ewes carried, however, would be that which

could be safely run on the available pasture land supplemented by the grazing afforded by the wheat and oat crops and their residues, plus also any stored fodder from the oat crops, in the form of silage, hay, or grain, well protected from rain and vermin.

To increase the sheep-carrying capacity of the holding, should it be considered more profitable to do so, it will be necessary—after having brought the grazing portion to its highest capabilities by top-dressing and other pasture improvement methods—to reduce the wheat growing acreage in order that other crops can be grown for sheep feed, either by grazing or by being cut and fed to them.

The less costly crops for this purpose will be those which can be grazed when required, and which, when not needed for grazing, can be harvested and reserved for fodder when a shortage occurs. Lucerne is probably the best crop for this purpose, being of high feeding value at all stages, and one which does not deteriorate readily when reasonably well stored and protected. It will grow for grazing purposes on practically all wheat lands, providing good feed for several seasons and occasionally giving fair cuts which can be made into silage or hay. It is also valuable in the renovation of worn-out wheat lands, and thus becomes an excellent rotation crop in the production of wheat.

A fresh area of lucerne put down every six or seven years, while the previous one is brought under wheat again, would mean heavier crops of wheat, while the grazing and fodder supplied by the lucerne would permit of a much greater number of sheep being carried. This system would require the cultivation area to be divided into four portions; one under lucerne, one being fallowed, one under wheat, and one under oats. The cultivation costs of this rotation would be lower than that previously referred to, on account of the reduced area to be worked, as the lucerne area, after planting, would require little other than an annual cultivation and top-dressing, and an occasional harvesting, while the high standard of fertility which the inclusion of lucerne in the rotation would produce, would be reflected in the succeeding wheat crops, making them more profitable than those grown on a greater portion of the area under a rotation where lucerne did not take a place.

With this system, and to distribute the cultivation work over a longer period of the year, and also to provide green feed other than lucerne for sheep during the summer months, a portion—say one-half of the wheat stubble land—could be planted with Sudan grass each year, instead of planting the whole with oats. This would relieve the work in autumn, as only 50 acres would be required to be prepared for oats, the remaining 50 acres being left in stubble for grazing until the wheat and oat crops had been planted, when it would be ploughed and made ready for the planting of the Sudan grass in September or October. This crop could be grazed throughout the summer months if required, or allowed to seed and then harvested for grain, and the residue would be cleaned up by the stock in time for fallowing for the succeeding wheat crop.

Sudan grass has proved its value as a grazing crop, carrying several sheep per acre for its growing period, which is from October until the end of April. It is also a profitable crop to grow for seed, and in 1921 at Cowra Experiment Farm it yielded over 1,400 lb. of seed per acre—a return of about £34 per acre. For the purpose of wheat growing, Sudan grass may not be as suitable as a crop of oats, but by alternating it with the oats it would not occur frequently enough in each sub-section to cause much loss, and any which did result would probably be more than made up by its inclusion in the rotation, providing a more varied diet for the sheep.

Barley is also a good grazing crop, but it is not suitable for rotation where wheat is the main crop, as it is affected by some of the diseases which attack wheat. It is also difficult to prevent it from getting mixed with wheat or oats if grown on the same land, as it cannot be graded out.

By adopting a system of rotation, such as that outlined, neither the wheat growing nor lamb raising should suffer from the ravages of drought, and the provision of plant and animal food in abundance would ensure high yields, while high quality lambs which would command the best prices would prove most profitable.

POTATO TRIALS AT CORAMBA.

POTATO trials were conducted during the year in co-operation with Mr. M. D. O'Connell, Riverbyn, Coramba. The experiment was located on yellowish, clay loam which had previously been cropped with maize. The land was ploughed early in June and left in the rough state until planting, when it was thoroughly harrowed. Planting was carried out on 21st July, 1927, and harvesting on the 24th November, 1927.

The rainfall during the growing period was as follows:—July, 15 points; August, 50 points; September, 231 points; October, 294 points; November, 375 points; total, 965 points.

The results obtained in the manurial trial with Factor variety were as follows:—

	Tons.	cwt.	qr.
Superphosphate, 2½ cwt. per acre, and cow manure ...	8	5	0
Superphosphate, 2½ cwt. per acre...	6	9	3
Cow manure...	5	0	1
No manure	5	8	0

The cow-manure used in the experiment was obtained from the cow-yard, and was applied along the drills at planting.

In the variety trial, the yields were as follows:—

	Tons.	cwt.	qr.
Factor	6	9	3
Satisfaction	5	12	3
Carman No. 1	4	16	1

Superphosphate was applied at the rate of 2½ cwt. per acre.—M. J. E. SQUIRE, Agricultural Instructor.

The Control of Liver Fluke in Sheep.

H. R SEDDON, D.V.Sc., Director of Veterinary Research.

THE parasite *Fasciola hepatica,* commonly known as Liver Fluke, is well known amongst sheep-owners, but there are certain aspects regarding its action that just now might be emphasised, and certain features concerning its development which, in view of methods of control by medicinal treatment and otherwise, might well be discussed.

The general life history of the parasite is now commonly known—how from the eggs, voided with the sheep droppings, embryos hatch out, and these ambryos require to pass through a certain species of snail and undergo proper development before they can infect a sheep.

Observations on the Host Snail.

Investigations by Bradley led him to incriminate *Limnaea brazieri* as being the probable carrier, and McKay, as a result of experiment, was able to show that this snail is in fact able to act as the host, and, from other information, was able to deduce that there is reason to believe that this is the common host in New South Wales.

The detection and recognition of this snail is no hard matter for pastoralists. It prefers comparatively shallow water, commonly water an inch or less in depth. At times it occurs in deeper water, but I have not found it in water more than 9 inches deep. Further, though it may be found at the edge of large ponds and in rocky pools, it seems to prefer slowly moving streams such as shallow drains with merely a trickle, and, above all, a muddy bottom. Thus it is extremely common at the head of springs, in the small "pot holes," and in the holes in the "black bogs" so common in the Monaro. In the case of larger streams, it is, as a rule, not found where they flow strongly, but in the pools along its banks, and particularly amongst the water-cress at its edge. The snails seem to be attracted by the warm sunshine, and one frequently finds them, even in warm summer weather, on rocks an inch or two below the surface, on slimy rocks or muddy banks, on the edges of water troughs, and at times on the surface of what is popularly known as "frog's blanket."

Their preference for such vegetable harbour as water-cress and frog's blanket, and the prolific growth of this material constitute one of the difficulties in the control of the snail.

In searching for these snails, therefore, particular attention should be paid to places of the type mentioned. There one will find small conical snails, varying from little larger than a pinhead to about one-third of an inch long. Not all conical snails are of the harmful type, however, and the stock-owner is directed to examine the snails by placing them on their back, with their opening uppermost and to note whether that opening is

on the right hand or the left hand side. The dangerous type are right-handed snails. Another way is to hold the snail with its apex (point) towards you, and to observe whether the spiral is clockwise or not. If it is clockwise, *i.e.*, towards the right, it is the dangerous right-handed type.

At least two types of left-handed snails may be met with, one a small dark snail, otherwise like *Limnaea,* and the other a much larger, more globular, and lighter coloured snail. This latter being larger and occurring in large clear pools is very readily found, more readily than the dangerous *Limnaea.* Unlike *Limnaea,* however, it occurs in water up to 3 or 4 feet deep.

Particular attention should be directed therefore to *shallow water, trickling streams with a black oozy bottom, and "pot holes" near the head of springs, slimy rocks, and patches of water-cress,* and the presence of small dark right-handed snails should be looked for.

Fig. 1.- An Efficient Channel.

The ground to the right and the foreground, previously boggy, is now quite dry. Such a channel may be treated with bluestone with ease.

These snails, *Limnaea,* are essentially water-living creatures, but apparently they can live for a period on moist surfaces as the following observation will show. A pool about 15 feet long by 8 feet broad, with a muddy bottom, had been dried by diverting the water above it. At the time of first inspection the pool would be called "dry." The surface of the mud appeared quite dry, but it was cracked, and on carefully lifting up hunks of mud to expose the deeper surfaces of the cracks, living snails (*Limnaea*) were found adhering to the surface of the mud which at 2 or 3 inches below the surface was quite moist, though not very wet. The owner kept this pool under observation and noted that as the mud dried up and the cracks opened so the snails went down in the cracks. After the hole had been dry for about three weeks the water was again turned into it, and in less than ten days the snails reappeared at the bottom in numbers. (See Fig. 8.)

This pool was then treated with bluestone, and at the time of my visit some four months later appeared quite free of snails. It will thus be seen that temporary drying up of a muddy-bottomed pool does not necessarily lead to death of the snails. They may go down in the cracked mud, and live on the moist edges of the deeper parts of the cracks.

I am not aware of the life history of these snails (and do not think it has yet been worked out), but it may be mentioned that egg masses were plentiful in the Cooma district in November last, but none early in the following May. During the latter month, however, certain springs which had not been treated were examined and numerous very small snails were seen—snails little larger than a pinhead and with rather soft shells. None such being detected in the spring, I think it can be concluded, knowing the slow rate at which snails grow, that the snails breed in the spring and early

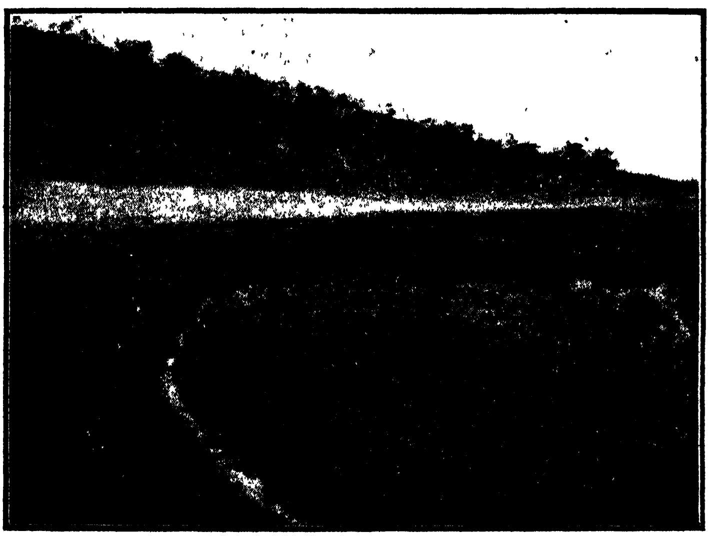

Fig. 2.—A Wide Boggy "Creek," Drained by a Channel.
The area to the right of the drain is now quite firm and dry.

summer. Egg masses have been found attached to water-cress at the sides of streams, and on cress-covered marshy places, also on other vegetable matter about the head of springs, and, where they are very easily detected, on slimy rocks over which water trickles, in the small catchment streams of troughs. One trough cut in the rock was found to possess a host adhering to the side from just below the surface to a depth of 3 or 4 inches. From observations on this and other troughs it would seem that these offer extremely suitable locations for the development of these egg masses. These egg masses it may be mentioned are jelly like or slimy masses about one-half inch long, cylindrical in shape, attached at one end to the trough or vegetation, and studded with small dark points, each of which represents a developing snail.

Some observations on the presence of snails in troughs may be recorded. At one place a spring had been developed into a pool about 8 feet by 8 feet by 4 feet deep, faced round with stones and covered with saplings. Examination of this pool failed to detect any snails, though there were numerous snails in the muddy-bottomed, trickling channels running from the pool. (An examination some months later showed snails in this pool.) The water from this pool was carried to three troughs, one 80 yards, and the others 400 and 600 yards distant. The first trough showed numerous snails, particularly on the shady side and at the surface of the water. This trough was out on dry ground except for a temporary muddy area caused by failure of the ball-cock on the inlet pipe. Snails were present also in these muddy pools. The other two troughs further on were quite free from snails, and

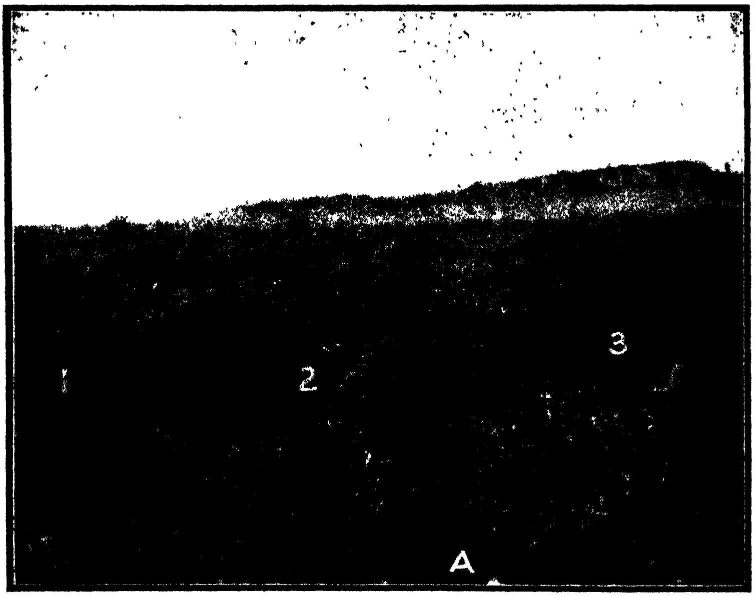

Fig. 8.—A Boggy Bank, Drained by Three Small Drains.

The three drains, which are marked 1, 2, and 3, lead to a common channel in the foreground, marked A.

their absence therefrom could not be accounted for by cleaning out of these troughs, for such had not been done. The question naturally arises, how did the snails get in the other trough? From the fact that the ground around was ordinarily dry, one was forced to conclude that they travelled down the supply pipe from the spring. That the spring was suitable for snails was shown by their presence therein on the later inspection.

But why were not snails present in the troughs situated 400 and 600 yards distant and supplied by the same pipe? These two troughs were controlled by efficient ball-cocks, and it would appear that either the distance or the physical conditions induced in the pipe by the presence of a ball-cock, or

the combination of both, did not allow of young snails being transported by water-piping for such a distance. Apparently, however, snails may be conveyed along a water service pipe at least 80 yards and undergo further development in the trough supplied thereby. This owner has adopted the same practice with several other springs, viz., excavation of a smaller or larger hole, stoning or concreting around, and delivery therefrom by piping. In all cases where all water was delivered through piping and where there were no trickling streams therefrom and no oozing banks around, such

Fig. 4.

Fig. 5.

Two views of a channel nearly choked by growth of water-cress and other weeds. Such channels cannot be efficiently treated owing to cover for snails.

improved springs have been found to be free of snails, and, except in one case, the troughs supplied by piping from the springs have been found to be free of snails.

The exception is worthy of detailed description as instancing another possible method by which a trough may be infested by snails. The spring was on the side of a gully with dry ground around. The actual spring had been excavated, and a hole about 2 feet each way stoned round and covered with a large stone. Piping led to a trough 70 yards distant, and though no snails were seen in the spring the trough contained numerous snails and

egg masses. This trough overflowed continually, the water running into a V-gulley with peaty banks. An oozy bank extended to within a few feet of the trough, and between the bank and the trough the ground (being comparatively level) was boggy. Snails were then numerous in the trickling stream in the V-gully, and in the boggy bank and pools right up to the overflow from the trough. The water from the trough did not fall clear, but ran over the end of the trough and down one of the wooden supports, which was covered with greenish slime.

As there did not appear any suitable harbour for snails within 25 yards of the spring, and the catchment area above did not contain any, it would appear impossible for snails to have access to the spring. Knowing the propensity for the snail to crawl up slimy moist surfaces of stone, even vertical surfaces, it does not seem unreasonable to assume that in this case the snails crawled up into the trough along the overflow.

This practice of stoning or concreting of springs and delivery therefrom by pipe should be strongly recommended. By it, a pure water supply, free from ova of fluke and other parasites, is assured, provided (*a*) a little care is taken to see that surface water does not run into the spring, and (*b*) that a clear drop is allowed for overflowing water from the trough, *i.e.*, there is no slimy trough side for snails to crawl up. This can be easily provided by the insertion of a short length of 2-inch piping in the end of the trough. and can be done as easily in a wooden as in a concrete trough, though of course the latter is to be preferred. This owner, it may be mentioned, has put up several excellent troughs of this pattern.

The addition, at intervals, of a little bluestone to the trough will, of course, ensure the destruction of any snails in troughs and keep down vegetable growth as well, but with a contaminated water supply frequent treatment is required.

One may recall another observation having some bearing on the breeding of snails. A V-gully with oozy banks containing boggy pools had been channelled, but insufficiently to drain the banks. It was treated with bluestone in December, but the difficulty of treating the banks effectually was appreciated. Examined later no living snails could be found in the channel, but by May snails were very numerous. These were all very small, averaging about one-eighth inch long, and it would appear that they had been bred in the oozy banks during the previous summer.

Summarised, it would seem that the following conclusions may be drawn as a result of last season's observations:—

1. That *Limnaea* snails prefer shallow water, marshy places, muddy bottomed channels, and "pot holes" in bogs, and work right to the head of springs.
2. That they may also be found in rocky pools, especially where these drain boggy areas, or where these pools overflow by trickling streams into boggy areas.
3. That in the case of streams, water-cress and frog's blanket afford suitable harbour.

4. That snails may be present in considerable numbers in troughs, and that these troughs may become infested by snails either (a) crawl- i up the slimy side or (b) coming down the service pipe from ...y infested spring.

...s the Monaro is concerned, egg masses are found during ...rly summer, the snails becoming separated and recognis- such by the autumn.

...ails may survive for at least some weeks in the moist cracked ...ud at the bottom of pools that have apparently dried up.

Observations on Infection of the Sheep by Young Fluke.

So far as I am aware no complete investigation has yet been made as to the time of year at which, in Australia, fluke embryos gain entrance to sheep. In other countries it is said that the cercaria leave the snails only in late summer or autumn and early winter.

This seems generally to accord with such observations as have been made here as to the presence of the cercaria in the snail. Thus Bradley found them in the Monaro during the month of May, but not during the subsequent June, July, and August. McKay records finding them during January and February in the Northern Tablelands, March at Blayney, and April at Sydney (no information as to other periods of the year). I myself have found numerous fasciolid cercaria (but according to McKay and Bradley not of the sheep liver fluke type) in November, but only odd ones during the subsequent May. Evidence would seem to point to the snail being infested during the early summer and the cercaria escaping after midsummer.

This seems to be borne out by what we know of the season for the entrance of the liver fluke into sheep. Opportunity presented itself of conducting a *post-mortem* on twelve sheep (eleven affected with liver fluke) in the Monaro during November, but in no case were other than adult liver flukes found. In the following May, however, in a *post-mortem* on the same property an animal recently dead of black disease was found to show numerous young flukes, one actually in the act of passing through the capsule of the liver. Examination of two sheep at Bungendore a few days later showed recent heavy infestation by fluke—infestation so severe as in itself to be sufficient to cause death of a number of animals. These losses had commenced in March, and though then dwindling, had continued into May. Previous experience in Victoria has demonstrated the occurrence of fluke infestation during March to June.

From what I have been able to gather, therefore, experience here is much the same as in other countries, namely, that sheep contract fluke from at least midsummer to late autumn, and even early winter. There seem grounds for believing that in the colder districts of the Monaro infestation may occur later than in more northerly parts of the highlands. At the same time, it must be pointed out that it is precisely at this time of year that sheep are commonly forced, through drying off of grass and other herbage, to graze in and around swampy parts and springs—those localities where fluke embryo would be likely to be present in the vegetation.

I do not think, however, that this is the sole reason for sheep becoming infected at that time. It appears to me that the forcing of the sheep into the marshes is more a providential action of nature to assis[illegible] the perpetuation of the liver fluke.

Liver fluke produces two quite different types of dise[illegible] may be referred to as—

(1) Acute fluke disease; and

(2) Chronic fluke disease.

What the sheep-owner commonly knows as "fluke" is chr[illegible] disease. It is in that form that one sees sheep exhibiting "bottle jaw," anaemic skin and mucous membranes, lack of lustre of wool, wasting, and perhaps "pot belly."

Small wonder is it then that when sheep are found to show no symptoms, but to be simply found dead, or, if exercised, suddenly to show acute symptoms of illness, throwing the head up, staggering gait, marked weak-

Fig. 6.—A Drain in Need of Attention.

ness, inability to travel further, with frequently death in a day or two—particularly when these symptoms are present in a well-conditioned animal with pink skin, normal coloured eye, and lustrous wool—the sheep-owner fails to recognise the cause as being due to liver fluke.

On opening a case of *chronic* "fluke" disease one finds the characteristic pipey liver, with numerous fluke present in the enlarged bile ducts and the gall bladder.

In *acute* fluke, however, one sees a mottled liver with a roughened surface, and, when infestation has been severe enough to cause early death, *often no flukes are seen.* Instead, one finds small reddish areas, soft in consistency and looking like little abscesses; or small greenish or yellowish areas often rather dry in consistency. It requires careful dissection of

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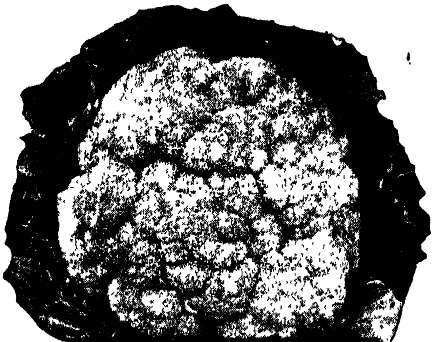

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these areas to find the young flukes, and in many no flukes can be found—only degenerated fragments, for a great number of young flukes entering the liver never reach the bile ducts where they may attain maturity.

As mentioned previously, the young flukes pass through the wall of the stomach, and after remaining in the belly cavity a little time enter the liver through its capsule or covering membrane. They thus enter the liver structure itself, and there do incalculable damage. They lead to such grave destruction of liver substance that the sheep succumbs to toxaemia, the result of interference with liver function. It is to the inflammatory changes consequent on their punctures in the capsule that the roughened surface is due.

Had the infestation by fluke not been so severe the sheep could have withstood it, and many of the embryos could have passed from the liver tissue to the interior of the bile ducts, and so developed into the easily recognised

Fig. 7.—The same Drain as in Fig. 6 being Cleaned Out.

leaf-like parasite. In the bile ducts, the fluke produces its effects more gradually, and the main change is one of anaemia, with its common symptoms of white skin, bottle jaw, &c.

The Control of Liver Fluke in Sheep.

The following points arise from the foregoing:—

1.—That the presence of a particular type of snail is necessary for the development of the liver fluke, and that sheep do not become infected one from another directly.

2.—That this is a water-living snail, one preferring shallow water.

3.—That the snail breeds in spring and summer. Whether the young snails are able to act as hosts during the summer or not is not known.

4.—That fluke embryos gain entrance to the snails in spring and summer, and leave them during the summer and autumn.

5.—That sheep become infested with liver fluke from midsummer to late autumn or early winter.

D

6.—That fluke affects sheep during either early autumn (as acute fluke disease) or winter (chronic fluke disease).

Thus there are the following methods by which liver fluke disease of sheep may be controlled:—

1.—Destruction of the host snail (for without it fluke eggs dropped by sheep cannot undergo their full development).

2.—Prevention of infection of snails by fluke embryos.

3.—Destruction of young flukes after they have left the snail, and/or prevention of their entering sheep.

4—Destruction of flukes in the sheep.

5—Destruction of snails and flukes. (Combination of 1 and 4.)

Each of these five methods of control may be discussed in turn.

1. *Destruction of the Host Snail.*—This is the method *par excellence*, and provided the harbour for snails is not too great it can be accomplished.

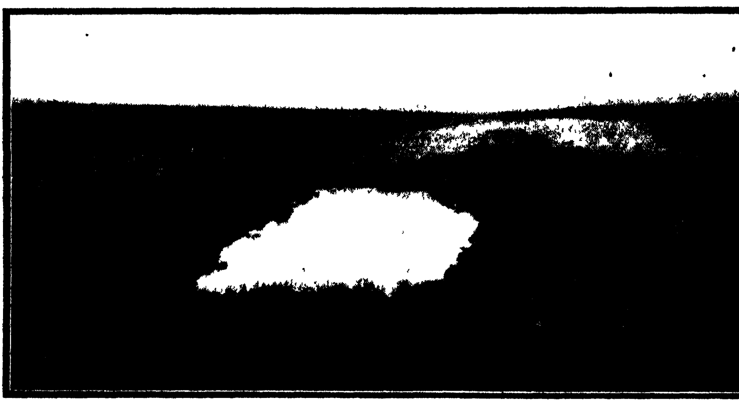


Fig. 8.—A Pool with a Story.

This pool was allowed to dry up, and it was found that snails penetrated the cracks in the mud and were able to obtain sufficient moisture to remain alive during the three weeks the pool was apparently "dry."

Thanks to the researches of Chandler in America, it is known that bluestone (copper sulphate) in very minute quantities is highly poisonous to snails, and this substance can be applied over the haunts of the snail either by spraying, dusting, or (possibly a superior manner) by dissolving it in the water in which the snails are present. From my experience in the field of the control of liver fluke by this means I am convinced that the success of this method lies in two directions, one largely assisting the other. These are (*a*) thoroughness of application, so that the poison really reaches all the snails and is not simply placed where a number are congregated and hence easily seen, and (*b*) the draining of swampy places so as to limit the areas habitable by the snail.

During the past year I have been privileged to watch the snail destruction methods adopted on a large property in the Monaro—an area which, with its manifold springs and creeks, would be regarded by the average grazier

as presenting an insurmountable proposition. There, however, war is being waged with a high degree of success, and should ere long be brought to fruition. Even now, after only one year's work, snails are only scarce, and in many places entirely absent, where they formerly existed in millions.

Those who are familiar with the Monaro district will appreciate the difficulty of dealing with "black springs" or bogs—areas from a few yards to a fraction of an acre in extent, with a wet, marshy grass, and tussock-covered soil, and presenting few pools that could be dignified by the term "waterhole," but numerous small pot holes with half an inch or so of water, many, no doubt, being formed by the feet of large stock. Then, again, there are the steep-sided V watercourses, with shaking, boggy sides, often only a few feet wide, but running the length of these miniature gullies. Frequently these boggy areas lie on a firm, rocky bottom, but the growth of waterweed and the action of water on the sides has formed about a foot of black alluvial deposit which in time has become more or less grassed over. In other places, where streams are well formed and run over a rocky bed, there is a dense growth of watercress along the banks, and, along with other waterweed, covering pools along the sides and tending to grow out over the whole surface of the creeks.

Experiments have shown that whereas a concentration of bluestone of from one in 1,000,000 to one in 2,000,000 will kill snails in relatively clean, pure water, when that water contains much dissolved organic matter, or when it holds much weed (algal) growth, it requires a much stronger concentration.

To free the water of this weed growth is very important from the point of view of killing power of the bluestone, but it is even more important, in order that the "harbour" for snails be reduced and the application of the bluestone to the snails facilitated.

Drainage of bogs, channelling of weed overgrown watercourses, and the pulling out of weed growth from the edge of larger creeks, are absolutely necessary in order that areas may be treated with bluestone effectively.

The drains in many of these places need not be wide nor deep, for experience has shown that small ditches about 10 inches wide by 10 inches deep cut in these "black springs," a few feet apart and converging to supply a common channel, will so reduce the level of water that, provided large stock are not allowed to break down the edges and block the drains, and that such areas do not contain "hoof holes," the intervening boggy areas will become thoroughly drained. If the water from these areas is not required, it can frequently be diverted, and allowed to spread over gently sloping ground. I have seen three such distributing drains from a single black spring, and by judicious diverting of the water from one outlet to another no further bog created where the water is allowed to spread.

Where the banks of a V watercourse are boggy the same measures can be applied—simply the provision of a small drain down the centre with proper distribution of "fall," leading to drying of the once boggy banks. In places where it can be done, as, for example, above a miniature waterfall, it is

advantageous to cut a new outlet drain *along* one bank and over to the comparatively flat ground away from the watercourse. By such means all down-stream swampy areas, if they do not contain springs, will soon become dried up, with consequent death of the snails therein.

An unduly boggy bank at some part can be dealt with by cutting a small channel at an angle and running it into the central channel.

There is a marked tendency for these small channels to become blocked with the growth of watercress and other waterweeds, with consequent damming back of water which, spreading out, raises the water level around and renders the sides boggy again.

Where there is growth of waterweed along the banks of creeks, such must be pulled out, and all pools along the sides, particularly *small* pools under stones, thoroughly exposed.

The success of these drainage measures lies, therefore, in determining the location of springs and keeping the water in channels, so cut that the level is 6 inches or more below the surrounding surface.

When such draining has been done, the matter of the destruction of the snails becomes a comparatively easy task. About 4 or 5 lb. of bluestone (commercial crystals) is placed in a small bag (sugar bag) and tied on the end of a pole about 5 feet long. One then walks along the channel, moving the bag in the water, when the bluestone will be found to dissolve out readily and "colour" the water. All the stream should be thus treated, and where the banks or sides are in the least boggy treated water from the channel should be well splashed over them. Particular look-out should be kept for all pools in boggy banks, and these treated with the bluestone bag.

Some authorities have recommended spraying the banks with bluestone solution. This might be done with advantage where there is an undrained boggy bank sufficiently handy to a large pool which has been bluestoned. Again, there may be places where water might with advantage be carted for the purpose.

Others have recommended mixing powdered bluestone with sand and spreading it broadcast over boggy areas.

All these methods have their advantages (and disadvantages), and each part to be treated has to be dealt with in the manner most suitable for it. The one thing to do is to treat *all* parts thoroughly. This is not so easy as may be imagined, and even though a big kill may be gained (as witnessed a few days later by the presence of numerous empty snail shells in some pool), it may be that, in some months' time, snails will again be found in the channel. Careful examination along its length will then reveal some boggy bank (may be only a few feet square) which has probably been insufficiently dealt with; or again, as has happened to my knowledge, it may have been that the head of the stream was not actually reached, treatment ceasing in some hole in a hillside gully, whereas a small boggy area a few yards higher up was the real spring, the water normally travelling underground along the intervening watercourse, but in flood times rushing over the surface and

carrying the young snails with it. As mentioned before, snails work right up to the head of streams and rivers, and it is from there and from boggy banks that the reinfestation of channels occurs.

The improvement of springs by digging out and concreting or stoning around and the distribution of water therefrom by piping to troughs is, where practicable, undoubtedly the best method or dealing with them.

2. *Prevention of Infection of Snails by Fluke Embryos.*—This is a method which prior to the employment of bluestone was universally recommended, but which now, in view of the success of the latter, is not so frequently stressed. The eggs of the liver fluke are voided by the sheep with its droppings, but unless they can soon get into water they die. Obviously the

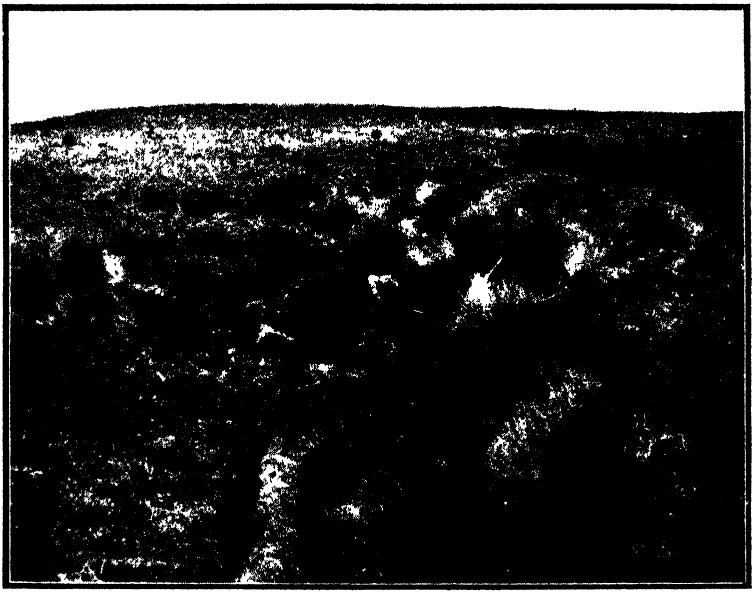


Fig. 9.—Searching for Snails in Small "Pot Holes" at the Head of a Spring.
Note the channel in foreground. The channel was later extended to drain these pot holes

most suitable course is for them to be dropped on marshy ground or in water channels, but in view of the flow of surface water it is apparent that during wet weather the presence of recent sheep droppings over quite a considerable portion of the catchment area around a spring, marsh, or watercourse must constitute a menace. Frequently have I felt, when viewing fenced-in springs and bogs, that the fence line was too close to the marshy area. A greater degree of safety could be ensured in these cases if a furrow were ploughed outside the fence in such a way as to divert surface water away to dry ground.

There are undoubtedly, however, certain places for which this method of control is specially suitable. It can be applied with advantage where portion of a creek forms a boundary or comes in on to one's property and the

bank is open to continued re-introduction of snails "from the man above." Sometimes such a water supply is required for stock purposes, at others it is not. If such a creek be fenced off it is often possible to supply water from some other source, but if not the provision of a windmill and pump, taking the water supply from a *deep* pool, will safeguard the supply. At other times there are places which are difficult to treat, or difficult to treat until drained, and it is better as a provisional measure to fence them off.

The damage done to drains by large stock has been mentioned. It is very real, and, in point of fact, until the bogs have become dry it is probably impossible to drain them unless at considerable expense if large stock have access to them. Fencing the areas off may then be done either as a temporary or permanent measure.

3. *Destruction of young Flukes after they have left the Snail.*—After the young fluke cercariae leave the snail they swim about for a little while and then, crawling a little way up blades of grass, &c., near the edge of the water, attach themselves thereto and encyst, as it is called. For this they secrete a gummy substance, which drying around them covers them with a

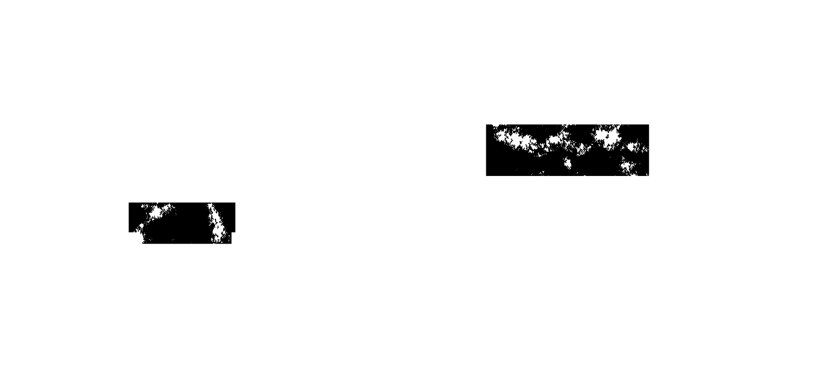


Fig. 10.—This Pool in a Stony Creek contained Myriads of Snails. Note the water was quite shallow.

very resistant skin, as it were. It is said that some cercariae may encyst on the surface of the water, but to what extent this happens in the case of the liver fluke I do not know. We may assume that the majority of these young fluke are to be found attached to blades of grass, &c., about the water's edge. Can we get at them there or prevent them entering sheep? To deal with them would mean repeated treatment of such herbage over a period of at least three or four months, for fresh numbers of cercariae are continually encysting.

In plentiful seasons sheep have little occasion to graze in marshy places, nor, for that matter, at the edge of the water, though they may do the latter when visiting the water to drink. In dry summers, however, with feed scarce, sheep are driven into these swamps, boggy banks, &c., and it thus happens that it is only following such seasons that fluke may be met with,

or becomes serious, on properties which ordinarily are regarded as sound. Fencing off such areas with a view to preventing fluke disease has been practised, but the exigencies of a dry season have at times forced the owner to open the fence and thus allow extensive fluke infestation to take place.

One can sum up this method of control, therefore, by saying that prevention of sheep taking up the encysted flukes on grass can be attained by fencing off, though if the areas are large and likely to be required for feeding sheep, it is a wholly impracticable measure. It is unfortunate that such areas would be required for sheep just at that time when the fluke cercariae would be most numerous and ready for ingestion by sheep.

4. *Destruction of the Flukes in the Sheep.*—For many years the sole treatment against the liver fluke was a drug known as male fern, which was administered in the form of an ethereal extract, standardised according to the requirements of the British pharmacopoea. This drug, while found to be very effective in expelling the flukes from the liver, had three serious drawbacks, in that it was (1) expensive, (2) difficult to prepare and administer, (3) poisonous in overdoses.

Quite recently, Montgomerie in Wales and Norris in Ireland have demonstrated the efficacy of the drug known as carbon tetrachloride, their work being confirmed in this State by experiments carried out by officers of the field veterinary staff and myself. As a result of this work, the use of this drug can be recommended with the greatest confidence, as it has been found that the drug is practically 100 per cent. efficient. Acting upon this advice, stock-owners have been quick to adopt the new treatment, and many reports have been received from these men, indicating their extreme satisfaction with the results of their experiences, not only as regards the almost immediate results in the treatment of sheep, but also as regards the ease and rapidity with which the drug can be administered.

The drug can be given in either one of two ways: It can be administered (1) as a drench by means of a syringe, or (2) in a soft gelatine capsule.

The dose of carbon tetrachloride, which should be the chemically pure drug, is 1 cubic centimetre. We have shown that for convenient administration, this may be diluted with 4 c.c. of liquid paraffin, and the 5 c.c. of the mixture given by means of a syringe, simply squirted into the animal's mouth.

A "Record" syringe, graduated up to 5 c.c., is probably the best in use. Some firms supply this syringe fitted with a special nozzle for convenience of administration, and this fitting has been found to act very satisfactorily in practice. In treating sheep, the drug should be ordered made up as follows:—

Carbon tetrachloride (medicinal) ...	1 part.
Liquid paraffin (medicinal) ..	4 parts.
Dose :—5 c.c. of the mixture.	

When ordering, the number of sheep to be treated should be stated. The cost of treating sheep by this method is about a farthing per sheep.

When given in capsule form, the dose (1 c.c.) is contained in a soft gelatine capsule, and to ensure that the sheep get the medicine properly, the capsule must be placed over the elevated portion of the back of the tongue. This can be done with the fingers, if the tongue is held out to one side, and the capsule, held between the ends of two fingers, is carried well back. It is easy, however, to make a home-made balling gun with a suitable length of metal tube, into which a plunger is fitted.

The objections to this method of administering the drug are that it is more costly than the liquid form, and more difficult to administer. The capsules, however, are being used now by quite a number of small owners.

Both these forms of the drug can be secured by ordering through local chemists, or by ordering direct from one of the wholesale druggists. No special precautions are necessary as regards handling the sheep, as they may be brought in from the paddock and returned after treatment.

5. *Destruction of Snails and Flukes.*—As stated earlier, observations go to show that the young flukes enter the liver during summer, autumn and early winter, the autumn and early winter being seemingly the common period in the southern highlands of this State.

From this it would appear that the best time to dose sheep with carbon tetrachloride would be autumn to mid-winter, as by then the flukes would be easily destroyed by the drug. The drug, being almost 100 per cent. effective, would then destroy the flukes before they had produced their usual spring crop of eggs, and so the chances of snails becoming infested would be immeasurably reduced. If, therefore, anti-snail measures have been carried out energetically during the previous summer, and a further bluestoning in early spring, there should, with winter dosing of sheep, be a minimum in spring and early summer of both snails and fluke embryos.

Summary.

Conduct a campaign against the snail during the summer and autumn (when water is at a minimum) by draining and bluestoning.

Drench sheep in the winter.

Bluestone again in early spring.

The combined method of fighting the snails by draining and bluestoning, and the flukes themselves by the use of carbon tetrachloride, seems to offer every possibility of safeguarding sheep against fluke infestation and seems to be the really rational method of control. To leave one or the other is to harbour a menace which, if the other becomes numerous, will provide all that is necessary to bring about serious losses.

Stock-owners are therefore strongly urged to adopt the double method advocated. Destroy snails and treat sheep.

Farm Forestry.

III.—Improvement and Regeneration of Naturally Occurring Trees.

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

In cases where a farm or holding has been taken up in virgin country the existing trees or forest cover may be utilised to form windbreaks, shade trees, and tree lots, or at least the nucleus of these. In treeless districts, or where the existing trees are very poorly developed, recourse must be made to planting, but on most areas nature has already provided useful tree cover. Full advantage should be taken of the natural growth, the complete destruction of all tree life by some settlers being due to lack of foresight and a proper appreciation of the usefulness of trees.

Fine native trees are often destroyed, the landowner eventually proposing to plant introduced trees, which, in many cases are not so satisfactory, and which take many years to reach the same stage of development. On many farms, however, trees have been spared from the general clearing operations, and, although very often these are performing their functions satisfactorily, in many cases their value for shade, shelter, or as a source of timber and fuel could be considerably increased by adopting improvement prunings, cuttings, and supplementary plantings.

Speaking generally, trees left standing after clearing operations may be divided into three classes—

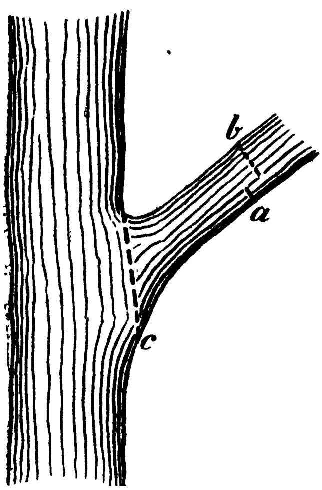
1. Shade and shelter trees and those selected for ornamental purposes.
2. Clumps or narrow belts of trees which serve as windbreaks and for shelter.
3. Trees which occupy land which is not required for clearing or which is unsuitable for crop production or grazing. Such an area may be regarded as a source of timber and fuel.

Shade and Shelter Trees.

A large proportion of the indigenous species are naturally fine shade trees, but there are many instances where their value can be considerably increased by judicious pruning or lopping. This is especially the case with the eucalypts. Although some of the gums, boxes, ironbarks, &c., make excellent shade trees without artificial aid, a large proportion are too sparse in the foliage and of poor shape for efficient shading. Such trees can be greatly improved by cutting, as the majority of the eucalypts produce heavy coppice or sucker growth. Dead and diseased branches should be cut out, the older branches shortened back, and cuttings made to bring the tree to the desired shape. For shade purposes a large spread of branches and the development of dense foliage is required rather than great height growth

and sparse foliage, and it often pays, in the case of tall trees, to lop the main stem 30 to 40 feet from the ground to encourage the formation of lateral development. By such cuttings the amount of wood is considerably reduced, but as the remaining portion has the full root system of the original tree to draw on, thicker and denser growth results. In many paddocks it is common to see trees which are of little value for shelter purposes, but which if pruned or lopped would be considerably improved.

In addition to the eucalypts, most other trees are improved by careful cuttings. In the western areas trees which have been lopped for fodder very often throw out compact new growth which makes them much more useful as shade trees. In passing through paddocks where the trees have been carefully lopped a season or so previously, one is frequently struck by the marked improvement in shape, beauty, and shading quality of such trees in comparison with unlopped specimens. Planted trees also require pruning and cutting, but the necessity for such work is generally most apparent in the naturally occurring trees.



The Correct Way to Remove a Heavy Limb.

Although the majority of native trees make good sucker growth and respond well to prunings, other species, particularly the conifers, are unable to sucker, and should therefore only be pruned to remove dead, diseased, or unwanted branches.

Winter and early spring are the best seasons for lopping or pruning, the most suitable time being when the tree is at a resting stage, but about to make new growth. Care should be exercised in the method of cutting, especially in the case of ornamental species or the most useful shade trees. Cuts should be made with either a sharp axe or saw, but preferably with the latter, and should always be slanting so that the surface will not retain water. Particular care is necessary when removing heavy limbs from the main stem. Heavy branches are often removed by a single cut from the upper surface, but the limb in falling generally tears away the bark and outer wood from the trunk immediately below it. This makes a large scar and paves the way for further injury by insects and fungi. Such branches should be removed by the three-cut method. The first cut (*a* in the accompanying figure) should be made on the under surface of the limb about 6 to 12 inches from the point where the final cut is to be made, and reaching about a quarter way through the limb. The second cut (*b* in the figure) should be made on the upper side of the limb an inch or so beyond the first one and continued through until the limb drops. The third cut (*c* in the figure) is made close to the trunk to remove the stub.

The same method should be followed when shortening heavy branches. Heavy limbs can also be removed by a single downward cut in cases where the limb is supported by an overhead rope or propped up from beneath. In any case, no projecting stub should be left, as this dies back into the trunk, forming a vulnerable spot for fungus and insect invasion.

Where practicable, the wound made by the cut should be painted over with a mixture of creosote and tar. This both sterilises the wound and prevents the entrance of water, fungal spores, and insects. On some trees the tar mixture causes a certain amount of local injury, and in such cases a mixture of bluestone in water can be washed on to the wound. When dry the surface should be painted with ordinary paint or varnish. Decayed or infected wood should be removed wherever noticed, and the area painted with the creosote and tar mixture.

Occasionally a tree is damaged by insects, fungi, or fire to such an extent that unless attended to its complete destruction is imminent. In most cases it would pay to remove such a tree, especially as it represents a potential source of infection for other trees; sometimes, however, because of its particular value, or for the sake of associations, it is desired to preserve it. Where preservation is decided upon, the decayed or diseased portion should be completely cut away, the excavation being continued until the sound, uninfected wood is exposed. The newly-cut surface should then be sterilised and painted with tar. In many cases such measures will be sufficient to arrest decay, but attention must be given from time to time to see that no further infection or decay is taking place. In other cases, however, the portion taken away is so large or in such a position that the part requires artificial support, or needs filling to prevent further infection.

For filling such cavities ordinary cement is often used, but this has several serious drawbacks, the chief being that it lacks elasticity, the incorporation of a rigid unyielding mass in a living tree leading to straining and cracking when movements take place. The best material to use is some form of asphalt, an effective mixture being one of tar and sawdust. Wood shavings and sand may be used in place of the sawdust, such mixtures being very adhesive, absolutely waterproof, and possessing the required elasticity. It is often of advantage to fill the cavity only to the level of the cambium layer, as the latter, if uninjured, will promote callus growth, which in time will extend over the cavity and hide the filling.

Shade and ornamental trees with only a few dead limbs should be given attention, but where decay or damage is extensive, especially in the case of quick-growing, short-lived trees, the trouble involved is hardly worth while. In such instance complete removal of the tree and replanting is easier and more effective.

Groups of Belts of Trees for Breaks and Shelter.

In some instances the settler has spared from clearing operations narrow belts of trees along fences, roads, and around orchards, or groups of trees in the open paddocks. These serve as windbreaks and for general shelter,

and although in many cases they are very effective for these purposes, their efficiency is often impaired, particularly in the case of eucalypts, by their open character and general raggedness. In some districts where eucalyptus growth is unsatisfactory it would be best to cut over the area and plant with more suitable species, such as conifers, but where moderate growth is evident the natural shelter belt can be considerably improved by judicious cutting and planting to fill up blanks or open spaces.

Trees that are too open or of bad shape may be improved by heavy pruning and lopping, or complete coppicing may be adopted with advantage.

An Unlopped Ironwood (*Acacia excelsa*).
Compare this tree with the one on the opposite page, which was in the same paddock.

Coppice growth originates as shoots or suckers from the stump of a previous tree, and is brought about by felling close to the base of the trunk. Apart from shelter belt work, the system of coppicing is a simple method of dealing with the trees on the timbered portion of the farm which it is not proposed to clear and which forms the source of timber, fuel, and fencing posts. It is perhaps the surest and easiest method of securing natural reproduction, and is particularly applicable to eucalypts, the rejuvenating effect being very marked in cases of poor or worn out growth. On the

other hand, coppice growth seldom occurs in conifers, the reproduction of which must come from seed. Many of the native trees, however, other than eucalyptus, coppice freely, as, for example, the turpentine and she oaks.

During the first few years, coppice growth has a distinct advantage over seedling growth, as the young shoots have the root system of a well-established tree. Growth during the initial stages is therefore particularly rapid, a growth of 20 feet in two years being not unusual in the coastal areas. The quick results given and the simplicity of the operation will gain favour in the opinion of the farmer, who, in addition, will find the

An Ironwood (*Acacia excelsa*) which has been Lopped.
Note the marked improvement in shape and shade qualities after lopping for fodder.

method of especial value in providing small poles, fencing posts, fuel, or in thickening up a shelter belt which has grown tall but scanty. Where foliage is required for distillation purposes coppicing is also an effective method.

When cutting for coppice growth the cut should be made close to the ground, as the resulting shoots are less liable to breakage by wind, are more vigorous, and in some cases establish roots of their own. The cut should be clean and slanting, so that water will run off easily. Either saw or axe can be used, but the former implement is sometimes the better in cases where only one or two strong sucker growths are required from the

stump. It has been the experience of some that stumps cut by the axe throw out more numerous shoots than those cut by the saw, and that the coppice growth from sawn stumps is somewhat more vigorous. Winter and early spring are the best periods for coppicing.

Frequently quite a number of suckers arise from the stump, but if left to themselves two or three predominate and force out the others. This natural selection can be helpful by artificial pruning, the growth being thinned out after a couple of years. Two or three of the most vigorous and healthy shoots are retained, preference being given to ones having their origin close to the ground.

Coppice from over-mature trees will not produce strong growth, as the old root system has lost its vigour. The practice should, therefore, be limited to those trees which retain their capacity for producing vigorous shoots up to the required height. The number of times that a stump can be worked for coppice growth varies considerably with the species and the

A Natural Stock Shelter.

Such an area could be used as the nucleus of a useful shelter belt or grove, and could be improved by encouraging natural regeneration by further planting.

condition of the stump, but from a healthy eucalyptus stump three or four succeeding coppice growths might be expected, each rotation taking about fifteen years to reach maturity.

Repeated coppicing should not be attempted, as, apart from the increasingly weaker growth obtained, there is a marked tendency towards deterioration of the soil, which becomes exhausted by the repeated heavy growth of young shoots and suckers. Cutting over at short intervals also unduly exposes the soil to the sun and wind, resulting in a loss of humus.

It should also be remembered that the height growth of coppice shoots is limited, and that therefore this method is ineffective where tall breaks or big timber are required. For shorter breaks and for the supply of poles, small timber and fuel, however, the method of coppicing has much to recommend it.

Filling in Gaps or Open Spaces.

The shelter belt of naturally occurring trees is often marred by gaps where trees have been removed for timber and fuel. Further, in seeking to make the belt more effective, old and diseased trees must be cut out, thus creating additional open spaces. These gaps should be filled by planting young stock. Apart from filling empty spaces, it is best to add a number of seedling trees at intervals to ensure continued vigour and productivity, especially if the standing trees are fully mature or have been coppiced. New blood can in this way be infused into the shelter belt, making it more permanent and uniform. In some cases, especially where stock is excluded, there will be a certain amount of young seedling growth in evidence, which can be utilised for replacement and filling up work. The value and efficiency of the natural shelter belt can, therefore, be considerably increased by the removal of dead, old, and badly diseased trees, by the coppicing or pruning of those requiring treatment, and by planting young stock or taking advantage of natural regeneration to fill gaps and infuse new blood.

The Natural Treelot.

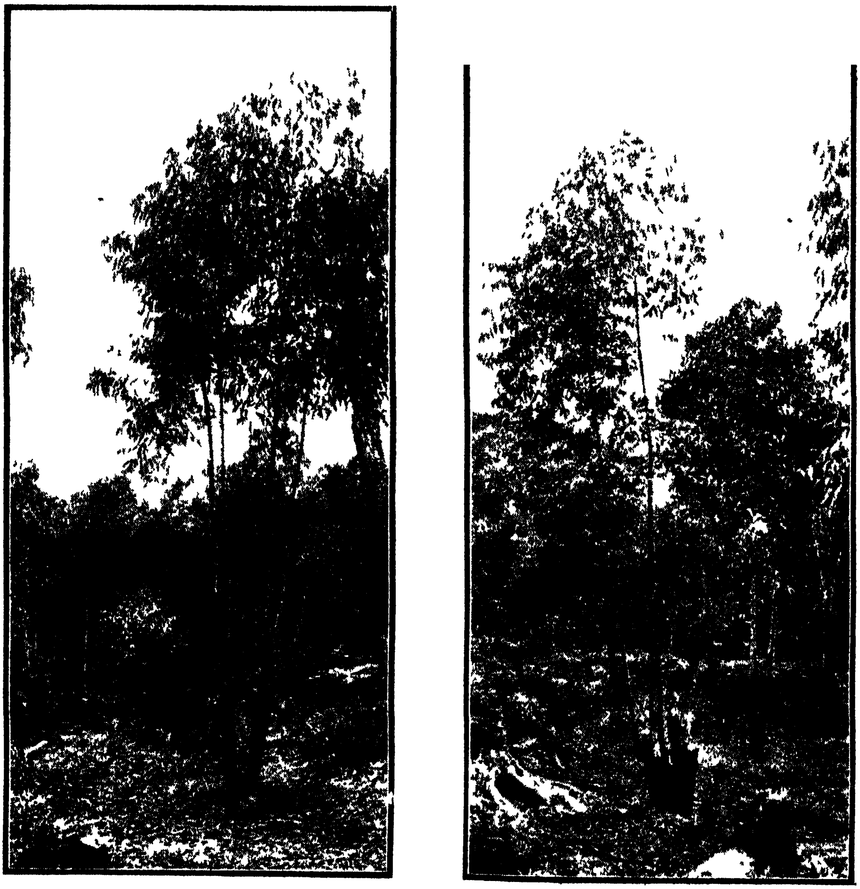
On many farms there is a certain percentage of land which is not considered profitable to clear for cultivation purposes. The native trees are left standing, and represent a source of timber and fuel until cut out. Such an area is the unused portion of the farm, and is regarded as being a profitless drag on the remainder of the land. The best and most useful trees are gradually cut out, leaving the worthless ones in possession. Stock are admitted freely on to the area, and any young growth is broken down or browsed off. Wide gaps are left in the stand, and the soil is exposed to sun and wind, resulting in a loss of humus and leaf mould. Constant tramping by stock renders the soil hard and impervious. This portion of the holding is merely looked upon as something to be exploited for a period and then allowed to remain as an idle, unprofitable, and useless eyesore. On coastal areas and where conditions are fairly favourable for plant development the area is invaded by weeds and shrubs, which add further to its unattractive usefulness. After a few years' exploitation it is finally composed of poor trees or undesirable species which form an open, irregular, and ugly stand. No young growth is in evidence, as soil conditions and the activities of stock make it practically impossible for any natural regeneration to occur.

Neglected in every way it has lived up to its reputation as the unprofitable portion of the farm. Originally such an area was the source of timber and fuel, but no steps were taken to make it a permanent resource or part of the economy of the farm's management. With a little attention it could be made a distinct asset, and apart from yielding timber, fuel, and fencing material, could be turned into a pleasant grove or plantation which would add to the attractiveness of the holding.

In some cases the area has been neglected for too long, or has been exploited to such an extent that regeneration by natural means is impossible. Clear cutting and replanting is then necessary. But where a

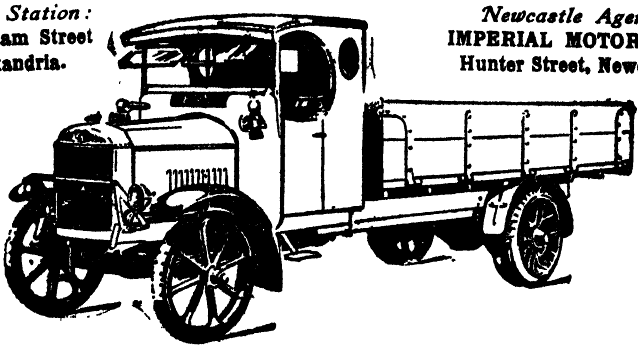
fair percentage of useful species are still standing, the area can be made both useful and profitable by establishing conditions favourable to natural regeneration.

Details of the methods adopted vary with local conditions, but, broadly speaking, the following procedure is followed. In the first place, all diseased and badly formed trees are removed and undesirable weed trees cut out. In many cases the undesirable species form a fairly high percentage of the total stand, their development being aided by immunity from cutting



Correct and Incorrect Methods of Coppicing.

owing to their worthlessness. These should be removed, and only those species left which are of general usefulness. Such operations are usually referred to as "improvement cuttings." If the stand of trees is very open, however, such cuttings should not be carried too far, as the removal of cover for the soil militates against the growth of seedlings and favours the development of weeds and grass, which render natural reproduction almost



impossible. On the other hand, as in some cypress pine areas, the growth of young trees is so thick that a heavy thinning is required in order to allow the development of an individual tree. For natural regeneration the soil should be shaded to some extent to retain a covering of leaves and mould and to prevent hardening. Where the growth is open, therefore, the weed trees should be removed gradually, and only after good seedling growth has resulted from the desirable species. Seedlings from the weed trees should be destroyed.

The trees left standing after improvement cuttings are the potential seed bearers, and on them is dependent the crop of seedlings for regeneration. The parent tree must, therefore, be able to produce good seed in sufficient quantity. Generally speaking, the majority of our natives trees fulfil this

A Shelter Belt of Blue Gum.
This belt has been cut for fuel and is now showing strong coppice growth.

requirement, although every year is not necessarily a seeding year. Under bad conditions, or in the case of certain species, several years may elapse before a good seeding results.

Assuming satisfactory seed production, the next requirement is that the soil is in a condition to form a good germinating bed. In many cases the soil has become so hard and dry, or covered with weeds and grass to such an extent, that successful germination is impossible. Breaking up the soil by ploughing or some other method is then necessary, as successful germination will not take place unless the seedling on germinating has ready access to the soil. Stock, of course, must be rigidly excluded from the area, as their activities are fatal to the development of young growth.

Where soil and climatic conditions are favourable, and where the species concerned are quick growing and hardy, young seedling growth from natural regeneration will be found to be very satisfactory. If particularly abundant, the seedling growth must be gradually thinned out. Details of thinning operations, spacing, &c., will be mentioned later when dealing with artificially planted areas.

As mentioned before in this article, coppice growth can also be profitably employed in the rejuvenation of worn-out tree areas. Combined with

Strong Natural Regeneration of Eucalypts.

Photograph taken ten years after treatment of the old forest, which is in the Wyalong district.

seedling growth, coppicing will have a marked effect on the improvement of the natural tree-lot, and in many cases will form the main method of regeneration. Frequently, owing to unfavourable soil and climatic conditions, the growth of seedlings by natural means is difficult or impossible. In such cases the regeneration of the tree-lot will depend upon coppicing combined with planting.

Under-planting is also a means of providing new growth to replace a stand of trees when the latter have reached maturity.

When planting to fill in open spaces, the same species or same class of trees that already comprises the stand need not necessarily be used, but, where possible, more desirable species should be introduced. Such an introduction will gradually lead to a conversion of the plantation to a more useful and profitable one.

In South Australia some success has followed on the attempt to convert second-grade eucalyptus forests to pine forests. The native growth in the areas concerned consisted of poor eucalypts and an undergrowth of shrubby species. Seedlings of *Pinus pinaster* were planted at intervals through the forest, and it was found that the pine, after a number of years, began to spread naturally between the parent trees, and showed a marked ability to compete with the scrub. Other species of pine have also regenerated naturally in various parts of that State. Similar results may be obtained in the farm tree-lot, and by careful planting conversion to a different type of growth may be obtained.

In many of the western districts tree-planting work is rendered extremely difficult by the very unfavourable conditions prevailing, and regeneration by natural means is practically impossible owing to stock eating or destroying young growth. It has been found, however, that by fencing off part of the land a marked growth of the indigenous shrubs and trees results. By keeping them fenced off until they have reached a size where they will be no longer damaged by stock, a fair amount of natural cover is obtained. The natural growth may also be used to give protection for tree-planting work, and in many cases will provide the small increase in favourable conditions which will mean the difference between success and failure. The fence, of course, must be both rabbit and stock proof. The growth on such areas is often remarkable, and can be used as the foundation of tree-growing work about the homestead and for shelter belts. Conservation and natural regeneration under western conditions are more likely to meet with success than artificial planting.

The landowner, then, should utilise to the fullest advantage all naturally occurring trees on his holding. This he can do by adopting suitable protection methods, encouraging natural regeneration, and by making improvement cuttings and coppicings. Additional growth or conversion to a better type plantation can be secured by plantings. By attention to detail, the shade trees and shelter belts can be made more efficient, and the neglected tree groups a permanent source of timber and fuel.

SEED OF NORFOLK ISLAND PINE.

THE Commonwealth Forestry Bureau has a quantity of the seed of the Norfolk Island Pine (*Araucaria excelsa*) for general distribution. The seed will be disposed of within Australia in lots of not less than 10 lb. at a cost of 12s. post free. Readers requiring seed should communicate with the New Guinea Trade Agent, Commonwealth Bank Chambers, Pitt-street, Sydney, enclosing remittance.

Quality as a Qualification for a Co-operative Concern.

Most citrus growers have heard of the Mutual Orange Distributors of California, knowing it to be one of the most successful non-profit co-operative citrus marketing organisations in the United States. According to the September issue of *Citrus Leaves* this concern adopts what many would regard as a radical policy in regard to its members, limiting their output and selecting members on the basis of the quality of their product. Says *Citrus Leaves*:—

"*Quality of membership and of product.*—This is the basic policy which has enabled the Mutual Orange Distributors to steadily grow. Rather than seeking to enlarge indiscriminately, it has chosen its members carefully and cautiously, restricted its tonnage, and sought to accept as members those growers who desire superior co-operative marketing service and who appreciate having their crop marketed under the personal direction of expert and skilled salesmen.

"*Restricts tonnage.*—That this policy has proved sound is evidenced by the fact that since its creation in 1906, the organisation has steadily and progressively developed until it to-day has approximately 40 member-groups, is marketing the citrus crop of nearly 3,000 growers, totalling almost 9,000 cars per year. It has had numerous opportunities to increase its tonnage and membership more rapidly, but guided by the policy of restricted tonnage and quality membership, it has admitted new units cautiously and only after careful investigation.

"*Limit established.*—A definite limit has been set. When that point is reached, no new members will be admitted. The limit in tonnage established is such that the organisation can give direct personal attention to every car of citrus products it markets, and at the same time give to the individual grower the close and efficient service which a genuine co-operative should render. Believing that the grower is the one to be considered first and foremost, the Mutual Orange Distributors has adopted a constructive policy which marks it as one outstanding organisation in the national co-operative field. Contrary to the policy of groups, which seek monopolistic and "100 per cent." control, it is proceeding and has proceeded with infinite caution and placed quality before quantity. The result has justified that vision of those men who laid down the policy, for the Mutual Orange Distributors has not only been able to sell the products of its members at consistently high prices, but it has likewise maintained a satisfied and harmonious membership —the coveted goal of every real co-operative organisation—and kept a constant personal contact with its members.

"There is, perhaps, no other co-operative marketing group engaged in distributing and selling citrus products, in which the personal equation—sincere, honest, and close membership-contact—is so efficiently and carefully sustained. The result of this exceptional contact is a better, more comprehensive, and satisfactory service for the growers."

The rearing of heifer calf or bull calf in an indifferent way will never be conducive to profitable returns. It is essential to be painstaking. As a rule dairy-farmers must select their own stock and rear them, for improvements are never made easily.—J. McLinden, in the New Zealand *Journal of Agriculture.*

Farmers' Experiment Plots.

Sweet Sorghum Trials, 1926–27.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

The growing of sweet sorghum for use in its succulent state as a fodder for dairy cattle is becoming increasingly popular on the South Coast, due to the fact that the recently introduced varieties are much to be preferred to the older varieties. It is chiefly late maturing varieties that are favoured, as they enable the dairy-farmer to provide succulent fodder for his stock when pastures are deficient. This feature of sorghum growing, however, depends on one important factor—that is, frost. Where hard frosts are experienced the results are not so satisfactory as in frost-free situations. Moreover, the fact must not be overlooked that the stems of the plant become very hard late in the season, and lose a lot of their leaf growth if left standing long. At the same time, suitable varieties of sorghum will be found on many farms which are very useful during the months of May and June as green fodders, to be followed by such crops as oats and wheat.

During the past season the Department had the assistance of the following farmers in conducting experiments with varieties of sorghum on the South Coast:—

T. J. Kelly, Tanja, Bega.
T. E. W. Irwin, Bega.
J. Alexander, Dapto.
J. W. Childs, Camden.

Of the plots, those at Bega were alone responsible for any returns, the failures being due to a very deficient rainfall. Rain fell in late December and in the new year, which enabled planting to be carried out. A dry spell followed until the end of March, when heavy rain fell, and the plants then made growth, but the ground became cold, and hard frosts were experienced, it being one of the worst seasons for sorghum growing experienced for many years.

Cultural Details.

The system adopted in sowing sorghum for green fodder is to drill in the seed in rows 2 feet 6 inches apart by means of the single-row maize planter fitted with a 10-hole thin sorghum plate and the 5 or 6-sprocket wheel on the shaft of the seed box. This will use 4 or 5 lb. of seed per acre according to the size of the seed. The old practice of sowing broadcast has nothing to commend it, as it is wasteful of seed and the crop cannot be cultivated.

All of the varieties under trial are looked upon as being suitable for the purpose required. If a choice had to be made it would be for White African, a variety which will stand longer than any of the other varieties

and at the same time yield very heavy crops. One crop came under notice during the season which was planted at the end of October, 1926, and was still succulent, although the stems were hard, at the end of September, 1927. As there were seed supplies of this variety obtainable at a few centres on the South Coast this season, and as the seed has been well distributed, the coming season should demonstrate its value generally over a wide area.

Superphosphate as a fertiliser has abundantly proved its worth for increasing the weight per acre of sorghum crops, and should never be dispensed with anywhere.

The following are the returns giving the acre yields of green fodder:—

	T. J. Kelly, Tanja.	T. E. W Irwin, Bega.
Sown	27th Oct., 1926.	18 Dec., 1926.
Harvested	May, 1927.	June, 1927.
Rainfall	1,150 points.	....
	t. c. q. lb.	t. c. q. lb.
White African...	7 11 0 0	9 6 1 0
Saccaline	13 7 0 0	9 18 2 0
Sorghum No. 61	7 6 0 0	7 14 1 0
Gooseneck	7 2 0 0	7 10 1 0
Collier	9 10 0 0	9 16 3 0
Honey	11 17 0 0	9 18 2 0

White Curl Grubs of the Wheat Root Beetle.

The white curl grubs of the wheat root beetle (*Anodontonyx tetricus*) have been in evidence on the property of a farmer at West Tamworth, during the past two seasons, and a number of observations were carried out this spring on his property. Prior to a visit to the Tamworth district during the first week of November, observations on grubs kept in the laboratory showed that the larvae were beginning to pupate, and examination in the field within a few days showed that the grubs there were also beginning to form the earthen cell prior to pupating. Arrangements were accordingly made with the farmer for the infested area to be ploughed to test the effect on the pupae of breaking up the soil finely. He has since reported that the work was carried out and that he "killed a lot of pupae."

The crops were largely a failure in this locality owing to drought, and the damage caused by the beetles was correspondingly greater owing to the fact that the growth of the young plants was retarded, and the crop was therefore unable to outgrow the attack.

That the vigorous growth of the crop is an important factor in limiting damage by grubs was demonstrated in the Murrumburrah district during the same period. A crop of 65 acres was badly infested with grubs, but owing to its vigorous growth it was able largely to outgrow the attack, and the final loss was estimated at about 7 per cent. Earlier in the season it appeared, from the large number of grubs present, that the loss would be as high as 30 per cent. This pest will be the subject of further discussion in an early issue of the *Gazette*.—T. McCarthy, Senior Assistant Entomologist.

Grazing Trials with Summer Legumes.

WOLLONGBAR EXPERIMENT FARM.

R. N. MEDLEY, H.D.A., Experimentalist.

A GRAZING trial with cowpeas, soybeans, patani beans, gotani beans, velvet beans, and Dolichos beans (*Dolichos lablab*) was conducted during the past season at Wollongbar Experiment Farm. The trial was sown on hurriedly-prepared land that had been previously cropped with wheat for hay. The land was twice ploughed and harrowed once. Sowing took place on 29th December, 1926, in rows 3 feet apart. Germination and growth was excellent throughout.

On 15th March the weights of green fodder were estimated as follows:—

	tons.	cwt.	
Cowpeas	7	3	per acre.
Velvet beans	5	17	,,
Dolichos beans	5	8	,,
Soy beans	4	18	,,
Gotani beans	2	11	,,
Patani beans	2	7	,,

On 16th March, *i.e.*, the day after this estimate was made, cattle were turned into the paddock and allowed to graze the crop lightly. The paddock in which the trial was sown contained a good growth of paspalum, but the cattle immediately commenced to graze the legumes, showing a decided liking for the velvet beans, Dolichos beans, soybeans, and cowpeas. These were eaten out within a few hours and the cattle then turned their attentions to the paspalum, without even touching the patani and gotani beans. These two beans possess a very penetrating odour when crushed and a rather objectionable taste, and to these facts may be attributed the dislike of the stock for them.

The cattle were only allowed to remain on the plot for one day, after which the paddock was closed and the plants allowed to make a recovery. The soybeans recovered most rapidly, and in a short time formed pods. Cowpeas, which consisted of the early maturing varieties, after showing some signs of recovery, died out. An excellent recovery was made by the velvet beans and Dolichos beans, the latter showing up slightly the better in that respect. By 28th May the plots were in a condition that allowed of their being grazed again. This time the soybeans and cowpeas had, by the reason of their shorter growing season, died off, leaving velvet beans, Dolichos beans, patani beans, and gotani beans in the trial. The bulk of fodder on the two first-mentioned plots was almost as great as when the first grazing was commenced, while the last-mentioned two crops remained as at that time, not having been grazed at the first grazing. Pods had formed on the patani and gotani beans by the time the second grazing commenced.

During the second grazing, the same marked preference was shown by the cattle for velvet beans and Dolichos beans, and it was not until these had been completely eaten out that the cattle grazed on the patani and gotani

beans. This eagerness of the stock for the legumes illustrates the urgent need for the provision of some leguminous crops to supplement the pastures in the "Big Scrub" country. The time of the year when the need for legumes is most urgent is during the summer and early autumn months before the White clover makes its growth. The pastures at that time of the year consist solely of paspalum, and if the growth of such crops as velvet beans and Dolichos beans could be encouraged and fitted into the farm practice, much would be done to better the productiveness of the dairy herds in the "Big Scrub," where only a few farmers are able to go to the expense of buying feeds to supplement the pastures and non-leguminous fodder crops.

The summer legumes, particularly Dolichos beans, make a fair growth in most seasons in this district, and there is not much difficulty in preparing the land for them. Moreover, the rapidity with which they recover after being gazed makes it possible to obtain three, and perhaps more, grazings in the one season.

"Cleanliness" and "Choicest" Cream.

In a large percentage of the cases where inferior cream is supplied to factories, the trouble, when investigated by field officers of the Department of Agriculture, is found to be caused by faulty methods of washing the utensils. Often it is found that warm water only is used for washing purposes, and that the separator parts and utensils are left with a greasy surface, which, when exposed to the heat of the day, often produces a tallowy smell, and immediately affects the cream at the next separation. To remedy this fault all separator parts and utensils should be washed in cold or luke-warm water, then again in hot water which contains a small quantity of washing soda, and finally they should be rinsed by being plunged into a can of boiling water or placed in a vat in which the boiling water is poured over them. It is essential that the water be boiling, for not only is the germ life then destroyed, but the utensils dry almost immediately, and the liability of rust formation through moisture remaining on the surface is lessened.

In quite a number of cases where milking machines are in use the trouble is caused by insufficient attention being given to cleanliness. Very often it is found that the milk rubbers contain on the inside surface a coating of stale, cheesy milk, which results in the immediate contamination of the warm, fresh milk as it passes through the vat at the next milking. Sometimes the trouble is caused through neglect to dismantle the vacuum tank. To avoid trouble with machines they should have pumped through them after each milking (1) cold or luke-warm water, (2) hot water to which has been added a tablespoonful of caustic soda to every 4 gallons of water, and (3) boiling water. After each milking the vacuum tank should be dismantled and washed.

Badly tinned vessels, such as benzine tins, often result in a metallic flavour being imparted to the cream, and the faulty placing of the exhaust outlet from the engines, so that fumes come back through an open door or window, is another frequent cause of inferior cream; the remedies for these are obvious.—C. S. Kentwell, Dairy Instructor.

Field Experiments with Peanuts.

TIME OF PLANTING AT GRAFTON EXPERIMENT FARM.

R. J. DAVIDSON, H.D.A., Experimentalist.

THE experiment to ascertain the best time to plant peanuts, with regard to both yield and quality, was continued during the past season, Medium White Spanish being the variety used for the purpose.

From July until mid-December dry conditions ruled. The rainfall consisted entirely of light scattered showers, and was insufficient for requirements. The dry spell broke in mid-December, and throughout the remainder of that month and January very heavy rain fell. Good showers continued practically until mid-April. Dry conditions followed, and with the exception of two falls in June no further rain was registered.

RAINFALL.

	Points.		Points.
August	72	January	1,363
September	61	February	56
October	76	March	321
November	Nil.	April	334
December	760	May	Nil.

Cultural Notes.

The trial was located on sandy loam which had previously carried an autumn crop of potatoes. It was ploughed on 23rd July, harrowed on 2nd September, disc harrowed on 10th September. Plot 1 (October planted) was harrowed on 16th October prior to planting, and the remainder of the experiment area was mouldboard ploughed on 18th October, harrowed on 22nd October, rolled on 20th November, and harrowed on 24th November. Plot 4 (January planting) was also springtoothed on 14th January prior to planting.

Each plot consisted of six rows, 3 feet apart and 4.1 chains long, being in area .112 acre. Shallow drills were opened, and the kernels were dropped 6 inches apart and covered with a small hand plough. The rate of seeding was approximately 34 lb. per acre.

Plot 1.—Planted on 16th October after 20 points of rain. Two further light showers fell during the month. The growing crop was inter-row cultivated on 10th, 21st, and 31st December, 4th and 15th January, chipped on 17th January, cultivated on 7th February, and hilled on 14th February. This plot was harvested on 15th March. Total rainfall during growth was 2460 points.

Plot 2.—Planted on 25th November. The soil was somewhat drier than in the previous month, and no rain was registered during November. The growing crop was inter-row cultivated on 10th, 21st, and 31st December,

4th and 15th January, chipped on 17th January, cultivated on 7th February, hilled on 14th February. Crop harvested on 19th April. The rainfall during growth was 2834 points.

Plot 3.—Planted on 23rd December, after a week's rain which yielded 472 points. Further heavy falls occurred shortly after. The growing crop was inter-row cultivated on 31st December, 4th and 15th January, chipped on 17th January, cultivated on 7th February, hilled on 14th February. Harvested on 29th April. Between sowing and harvesting 2276 points of rain fell.

Plot 4.—Planted on 14th January. Moisture was plentiful. The growing crop was inter-row cultivated on 7th February, chipped on 9th March, and hilled on 15th March. This plot was harvested on 9th May. Total rainfall during growth, 1791 points.

Harvesting.

The vines were ploughed out, allowed to wilt for a few days, and stacked round poles to cure. As protection against weather and birds they were covered with a little dry grass and a small piece of wire-netting was placed on top. After curing in the field they were brought to the shed and threshed by hand.

The following were the yields obtained:—

	Nuts per acre	Hay per acre.			
	lb.	t.	c.	q.	lb.
October planting	1,445	1	4	3	23
December planting...	1,277	0	9	2	7
November planting	1,170	0	7	0	20
January planting	357	0	5	0	11

Showery weather followed the ploughing out of the October plot, but the nuts in the stack were not damaged. The remaining plots were harvested during dry weather.

Remarks.

The lower yield obtained from November planting may have been due to the dry conditions ruling at and immediately following planting.

The results this year confirm the previous season's experience that early planting gives the best results. The nuts from the October plot were well developed, bright and clean, and contained very few shrivelled kernels. The quality of the nuts from the November plot was about equal to the December plot, but slightly inferior to the earliest planting. The January planting produced smaller kernels, with a higher percentage of shrivelled.

The hay was a very fair sample, and was readily eaten by cattle.

Spotted Wilt in Tomatoes.

R. J. NOBLE, Ph.D., M.Sc., B.Sc.Agr., Biologist.

THE Spotted Wilt disease has again caused serious losses in tomatoes grown in this State. In some instances, as in previous years, over 90 per cent. of the plants in individual areas have been observed to be affected. It is the purpose of this note to draw attention to the features by which the disease may be recognised and to the control measures which have been recommended by the Department for the past two years.*

The disease was first recorded in Victoria in 1919[1] where it has caused very serious losses; it is also recorded from South Australia[4] and West Australia[2], and it has been known to occur in this State since 1920. The "Streak" or "Winter Blight" disease of tomatoes in Canada and the United States, recently reviewed and investigated by Vanterpool[5], has many features which resemble the Spotted Wilt disease occurring under local conditions.

No Known Cure.

There are several wilt diseases of tomatoes which are entirely distinct from one another, in that they are caused by different parasitic organisms for which different control measures are recommended. Wilting may be due to the action of parasitic soil-dwelling fungi, *e.g.*, *Fusarium* and *Verticillium*, or may be caused by a parasitic bacillus, *Bacillus solanacearum*. The Late Blight fungus, *Phytophthora infestans*, as the name suggests, frequently causes blighting or wilting in affected plants. The Spotted Wilt or Bronzed Wilt disease is distinct from all the above troubles, and these facts have possibly led to some confusion both in respects of control measures and the use of "wilt resistant" varieties. It should also be emphasised at the outset that there is no cure for Spotted Wilt in the sense that a diseased plant can be brought back to normal health again, but on the other hand, if appropriate measures are put into operation, the disease can be prevented from attacking other plants, and in this way control may be obtained. Various specifics have been placed on the market with the claims that their use will result in the cure of the disease. Such claims, however, are without foundation in fact.

No Resistant Varieties.

The small egg and cherry tomatoes are not severely affected by the disease even when attacked, but there are no commercial varieties which are resistant to the disease. It is well, therefore, not to be misled by the term "Wilt resistant" or "Blight resistant" tomato, for it generally refers only

* Spotted Wilt of Tomatoes (Plant Diseases Leaflet No. 37), issued by the Department of Agriculture, can be had on application to the Under Secretary.

to a variety which is resistant to the wilt disease connected with the *Fusarium* fungus, and certainly does not refer to the other diseases which are at times so destructive under local conditions.

Spotted Wilt is most noticeable in the early crops, but in some years the disease may spread throughout the season. Plants in any stage of development are subject to attack. The first symptoms appear on the young ter-

Fig. 1.—Tomato Leaves showing Early Signs of the Spotted Wilt Disease.

minal shoots. Small, brownish discoloured areas develop on the upper surface of the young leaves, and the discolorations may spread until the whole leaf is involved. On the slightly older leaflets the disease usually first appears in the form of smooth, greenish-brown spots between the veins. These spots then may extend until the discolorations amalgamate as before (Fig. 1). As the disease develops, the affected tissues blacken and shrivel

until the shoot appears as though it had been scorched by a flame. Brownish-black streaks may also appear on the surface of the stems and leaf stalks (Fig. 2). Vigorously growing plants seem most susceptible, and sometimes the plant may be killed within the space of several days. On the other hand, the disease may take several weeks before reaching its full development. Apparent recoveries also have been observed. New shoots

Fig. 2.—Tomato Shoot Affected with Spotted Wilt in Late Stage of Development.

may develop from the diseased tissues, and these shoots may grow for long periods before showing the usual symptoms of the disease again. The fruits on affected plants usually develop more or less sunken spots, and ripen unevenly. Very young fruits shrivel and fall.

Interesting Experiments.

A series of observations and tests have been conducted by this Department with a view to determining the nature of the disease. In 1921, Hamblin[8] reported that a careful microscopic examination of diseased tissue did not reveal the presence of fungi or bacteria. A series of inoculation tests with plant juices and with possible insect carriers (*Nezara viridula*

and the common green aphis) did not give positive results under the conditions of his experiments. Additional studies of the tissues of diseased plants made at this Branch in recent years have indicated that neither fungi nor bacteria are associated with the disease. Tests during the past three years with the seed from diseased tomato fruits indicate that the disease is not carried over by this means. On the other hand, the available evidence suggests that it is carried over from year to year in infected tomato plants or closely related weeds belonging to the same family.

With a view to securing further information on this disease, a series of inoculation experiments has also been conducted with the extracted juices of diseased plants, with diseased plant tissues, and also with aphides and

A B B B A

Fig. 3.—Earliana Tomato Tissue Graft Experiment.

A A, outside plants (checks), healthy B B B, inside plants, affected with spotted wilt

with capsid bugs. In one test the insertion of portions of diseased tissue into healthy plants on the 9th March, 1925, resulted in the development of spotted wilt symptoms in a number of plants between the 23rd and 31st March, 1925. Checks inoculated with healthy tissue did not become diseased (Fig. 3). Preliminary tests with capsid bugs transferred from diseased plants to healthy seedlings also resulted in the development of the disease. The disease was not reproduced under the conditions of experiment in all cases, but the evidence was sufficient to indicate that the disease belonged to the virus group, although much has yet to be determined concerning the possible constitution and nature of the complex which is regarded as the primary cause of the disease.

On the basis of these tests, however, control measures have been formulated by the Department. The disease is being intensively studied at the present time by an investigator who is working under the direction of the Commonwealth Council for Scientific and Industrial Research, and it was recently announced in the press that thrips have been determined as carriers of the disease. Further investigations should throw additional light on the relative importance of insect forms in this respect. It is well known that insects concerned in the transmission of the diseases in the virus groups are exceedingly difficult to control effectively. Therefore, it cannot be too strongly emphasised that the most important feature in the control scheme is that of the immediate removal of diseased plants, which otherwise would serve as a source of infection, and thus constantly menace adjoining healthy plants.

Control Measures.

The measures recommended by the Department for the control of spotted wilt are as follows:—

1. Remove and destroy affected plants on the first appearance of the disease.
2. Destroy weeds in the vicinity of the crop.
3. Stake and prune the plants.
4. Use insect repelling and destroying sprays, *e.g.*, home-made tobacco washes or commercial nicotine sulphate, and make frequent applications in the early part of the growing season.

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[4] Osborn, T. G. B.—Two Serious New Wilt Diseases. Jour. of Dept of Agric., South Australia, vol. 23, p. 437, 1919.

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INFECTIOUS DISEASES REPORTED IN NOVEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of November, 1927:—

Anthrax	1
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)	Nil.
Blackleg	1
Swine fever	2

—MAX HENRY, Chief Veterinary Surgeon.

Poison Bait for Grasshoppers.

Report as to Danger to Stock.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

TESTS as to the danger to stock of the distribution of poison baits on pastures for the control of grasshoppers afforded information that will be of interest.

1. *As to Toxic Dose of Sodium Arsenite for Sheep.*—Preliminary tests showed that doses of both 60 grs. and 20 grs. were fatal, the former in less than twenty-four hours, the latter in four days. A dose of 6.6 grs. produces no ill-effects. (The drug was given in a bran mash administered by the mouth, and the animals were allowed water *ad libitum.*)

2. *As to the Toxic Dose of Paris Green.*—Doses of 60 grs. and 20 grs. were fatal, death occurring on the second day. A dose of 6.6 grs. produced no ill-effects.

3. *Quantity of Mass, as recommended, which would contain a Toxic Dose.*—As a concentration of the poison in the mass is 1 in 53 (using 2 gallons of water), it would follow that, assuming the toxic dose of each poison to be 20 grs., a lethal dose would be contained in about 2½ oz. of poisoned mass. Or, expressing it another way, each pound of poisoned mass would contain 6½ lethal doses for the sheep.

4. *Attractiveness of Mass for Sheep.*—Three pellets of mass (but containing no poison), put on the floor of a concreted pen in which there were three starved sheep, were eaten; further portions of mass were also eaten. Two samples of *poisoned* mass were *broadcasted* on the floor to the same sheep, when one sheep was observed to eat some of the Paris Green bait, but the other sheep did not touch the sodium arsenite bait. My opinion is, therefore, that when large pellets of the bait are offered sheep may eat them, but when the bait is broadcasted like chaff it is not very attractive. Of the two, the Paris Green bait seems more attractive.

5. *Offer of Sodium Arsenite Bait to Sheep.*—

Experiment 1.—A sheep was placed in a concreted pen and ½ lb. of poison bait, containing 3.3 lethal doses of poison, was broadcasted over an area 12 feet by 6 feet. (This would work out at about 300 lb. per acre.) Water was allowed, but all feed was withheld during the night for twenty-six hours after the bait was put out, for the next few days the floor was strewn lightly with green wheat—only as much as the animal would eat. Thereafter the animal was fed for ten days on chaff. At no time was the sheep observed to eat the bait and no symptoms of illness were manifested by this animal.

Experiment 2.—Another sheep was penned on a well grassed plot 20 ft. by 20 ft., and 1 lb. of poison bait was broadcasted over this area. (This is equivalent to about 100 lb. per acre.) The sheep was allowed water, but had to graze for food. It remained normal.

6. *Offer of Paris Green Bait to Sheep.*—

Experiment 3.—This experiment was conducted in exactly the same manner as Experiment 1 (with sodium arsenite). The sheep was observed to gather the bait almost as soon as it was broadcasted, but did not eat very much of it. On the second day it was off its appetite to some extent and diarrhoea ensued during that night. This sheep lost considerably in weight, and was obviously ill from the second to the fifth day, after which it gradually recovered.

Experiment 4.—The sheep used in Experiment 2 was now (seven days after Experiment 2 commenced) offered 1 lb. of Paris Green bait, the bait being broadcasted over the same area. By this time the grass in the pen had been well grazed, but no further food was offered for twenty-four hours. Cut green wheat in small quantities was then strewn over the ground. The sheep was not observed to gather any of the bait, and no symptoms of illness were manifested.

Experiment 5.—A grassed area of 1/100th acre was enclosed with netting, broadcasted with Paris Green bait at the rate of 100 lb. per acre, and two sheep placed therein. Water was allowed *ad libitum*. The sheep ate the grass right down, and after three days had to be fed cut fodder, which was spread on the ground. No symptoms of illness were manifested by either of these animals, though kept on the area treated for ten days.

7. *Conclusion.*—It will be observed that when offered on a bare surface at 300 lb. per acre, neither bait was gathered in sufficient quantity to cause death, though I am of opinion that the illness in the sheep used in Experiment 3 was due to bait that it had gathered.

When applied to grass land at 100 lb. per acre, the sheep used did not gather sufficient to cause any symptoms of illness, even though they were kept on the area until the grass had been eaten out.

The foregoing experiments seem to indicate—

(*a*) That where the bait is applied in pellets (size of walnut) to bare ground, sheep may eat it.

(*b*) That when broadcasted on bare ground, sheep may take the Paris Green bait in sufficient quantity to cause symptoms of arsenical poisoning—possibly even death.

(*c*) That when broadcasted on to pasture even at a rate of 100 lb. per acre, sheep may graze over it without gathering a toxic dose

I may say that, under different circumstances, there seems to be a great variation in the toxicity of sodium arsenite for sheep. Thus in South Africa it was found in hot weather that a dose of three grains of sodium

arsenite (administered with copper sulphate) proved fatal to 40 per cent. of sheep; our experiments, on the other hand, showed that 6.6 grains was non-toxic. The South African results were considered exceptional, but it may well be that under certain circumstances a poisonous dose might be contained in 1 oz. of bait. It appears to me, therefore, very desirable that—

(*a*) The bait should be well broadcasted, and not spread in pellet or mass form.

(*b*) That it should not be applied to bare ground (where it would seem to be more liable to be gathered by sheep). Assuming that the finer the form of the bait the less likely to is it to be picked up, it would also appear advantageous,

(*c*) That stock should be kept off the baited ground for one or two days, by which time in fine weather the bait will have dried to "chaff."

With the use of bran alone, it is almost impossible to get the bait to stick in pellet form, and that vehicle therefore seems better than either pollard or a mixture of bran and pollard.

It would appear also that the green coloration of Paris Green bait exerts an attractiveness—at least on bare ground—and I would suggest, therefore, if sodium arsenite is equally effective, that the use of Paris Green be discontinued.

Finally, the inadequacy of these tests to meet all circumstances should be borne in mind, and also that one is using a poison.

(*a*) The baiting should be tested further under field conditions.

(*b*) *Always* it is better to guard against any possible accident, and if possible bait should be spread only where stock do not have access.

Fallowing Liberates Plant Foods

The mineral matters essential to plant growth are usually present in sufficient quantities in normal soils to last crops for hundreds of years, but they are held in such insoluble combinations that they only slowly become available, but the constant exposure of the soil particles to the weathering agents during fallowing operations considerably hastens the liberation of these plant foods in a form in which they are available to plants.—W. J. Spafford, in the South Australian *Journal of Agriculture*.

Silage Contains the Natural Juices.

The great advantage of silage as a method of conserving fodder is that in it most of the natural juices are preserved. Because of this, it provides succulence in the ration. In hay-making, on the contrary, preservation is secured by drying out the moisture, and while this method supplies a marketable and easily handled commodity, it has the disadvantage of sacrificing the natural juices of the plant. It is important to note that the addition of water does not make up for the absence of these juices.—P. Ryan, in the Victorian *Journal of Agriculture*.

Fumigation Tents and Sheets.

PLANS AND MEASUREMENTS.

W. LE GAY BRERETON, Assistant Fruit Expert.

THE Department receives inquiries from time to time for information on making fumigation tents and sheets, and while it is quite possible for a grower to make his own tents or sheets, or for his wife to make them for him (which is more often the case), it is considered wise to sound a note of warning as to the difficulty of sewing such heavy materials. The cutting is simple, but the sewing of considerable widths of heavy material on the ordinary household machine is difficult and very troublesome, and to those who contemplate making a fair number of tents and sheets, and who have not had previous experience, it is suggested that they first try their hands on one only before attempting the bigger job. Moreover, where funds will allow it, it is far more satisfactory to have the tents or sheets made by a tent manufacturer, who has suitable machines for sewing such heavy and wide material.

Measure the Trees.

The first task is to measure up the trees which are to be fumigated. The best method is to use a tape and measure from the ground on one side over the centre of the top of the tree to the ground on the opposite side, also round the tree parallel with the ground and at the greatest circumference of the tree. It is not necessary to measure all the trees, but care must be taken that the largest are included. If a very few trees are slightly larger than the rest, the covers (tents or sheets) can be cut to suit the main sizes, and they will also do the whole lot, provided extra care is taken to cover the few slightly larger trees. If, on the other hand, there are a few trees considerably larger than the main lot, a tent or sheet should be made to cover them, and they should be dealt with by themselves, as a set of mixed-size covers is not economical to operate, for when changing a line of covers it is almost certain that the big covers will not always come opposite the big trees, and there will be much hard work and loss of time pulling covers up or down the row to find suitable trees. The covers should be amply large enough, and if the trees are still growing allowance should be made just in the same way as when buying clothes for growing children.

The "Dome-shaped" Type of Tent.

When first fumigation was adopted in New South Wales many years ago, interest in a tent suitable for the purpose was taken by Mr. S. Walder, of Sydney, and he was responsible for a design that proved economical in material and that has been somewhat extensively used. The description which follows covers largely the tent which he designed, but with slight modifications.

The cutting of the "dome" type of tent can best be explained by example. Say, for instance, the tree is 24 feet over the top, add at least 3 feet to allow for an 18-in. flap on the ground on each side, making a total of 27 feet. An 18-in. flap is the least that should be allowed, a 24-in. flap being preferable. Assume the tree is 34 feet in circumference. Now, the "dome" type of tent is made in three sections, the width and length of the sections being arranged to give the necessary circumference and the distance over the top of the tree respectively. Calico can be obtained in what is claimed to be 72-in. widths, though it really averages only about 71 inches, and as something is lost in seams it can be calculated as 70 inches when made up. If two widths are used in each section, then the three sections will make 420 inches (35 feet) in circumference.

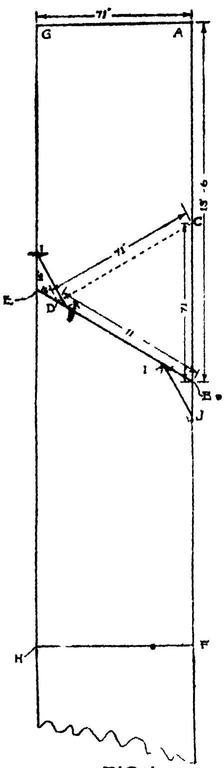


FIG I

The angle A B E is 60 degrees, and must be reasonably adhered to.

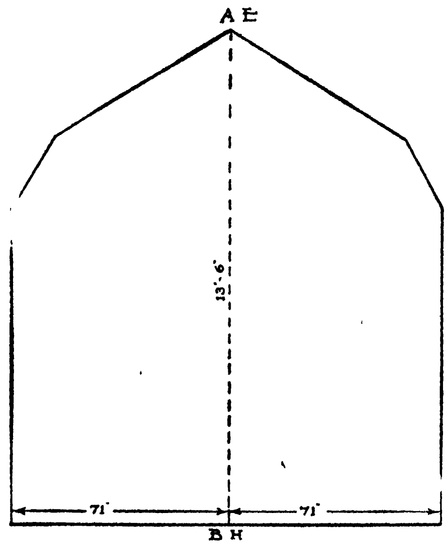


FIG 2

To cut the lengths, reference should be made to Fig. 1. Square off one end of the calico along one edge from A, measure 13 ft. 6 in.—which is half the length over the entire tent of 27 feet; this gives the point B. From B also measure off the width of the stuff (71 inches) to C; and with B and C as centres and radii of 71 inches descibe two arcs which will meet at point D; extend BD to E. The line BE will form an angle of 60 degrees with BA, but on account of the selvage being wavy and the tendency of calico to stretch, this angle of 60 degrees is better set out on a large sheet of strong brown paper and the calico marked from it. From B measure to F the same length as EG, and from E to H the same length as AB; measure the length

of BE and mark off one-fifth of this length from B to I and from B to J, also from E to K and E to L, and then cut along the lines BE, JI, KL, and HF. Seam these two pieces together along the edges AB and HE to form one section, as shown in Fig. 2.

Two more sections are made in a similar manner, and the three are then pieced together as shown in Fig 3. The small triangular pieces IJB and KEL (Fig. 1) are cut off, because if left they form three useless pockets when the tent is finally stitched up, and the tent is not really reduced in useful circumference by removing them.

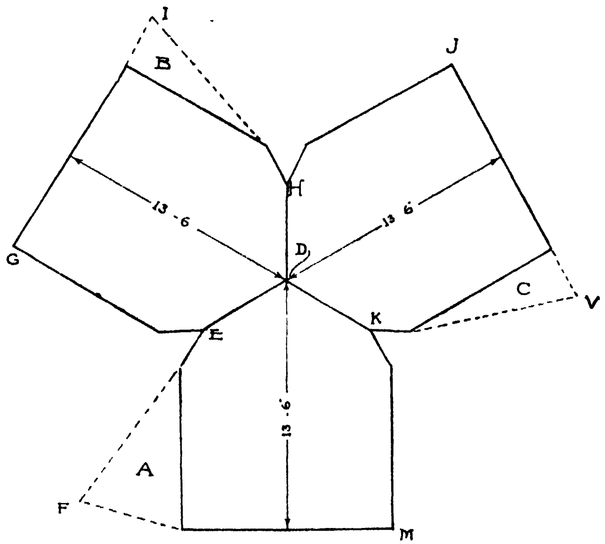


FIG 3

Ensuring an Ample Fit.

To give extra circumference, so that the tent will not fit too tightly, and also to splay it at the bottom (both important factors in making it easier to pull the tent on and off, and also allowing the flap to lie better on the ground), three gussets are inserted (see A, B, and C in Fig. 3). For a tent of the circumference mentioned the gussets can be cut from one 71-in. width, the length of the piece being the same length as JF or LG in Fig. 1.

The gussets are cut as shown in Fig. 4 (one being wider than the other two), and these will give 140 inches extra circumference to the tent at the bottom hem. When seaming the sections together it is handier to first seam the gussets on to their respective sections, and then all sections should be seamed together, i.e., DEF to DEG, DHI to DHJ, and DKV to DKM. All seams should be double, and the strongest thread that the machine will take should be used. When tents or sheets are being made in a factory the felling

seam should be used, but this is too difficult to carry out on wide widths of material with the ordinary domestic sewing machine. A round cap about 8 inches in diameter should be sewn on where the seams meet at D (Fig. 3) to add strength. The bottom should be trimmed evenly and then hemmed.

Mr. R. J. Benton, Citrus Fruit Instructor of the Department, has found, by measuring a great number of trees, that the distance over an orange tree is approximately two and one-half times the vertical height, so the tent described above should cover a tree from 9 ft. to 9 ft. 6 in. Twelve-feet trees are practically the limit in size on which tents can be at all conveniently used. A 12-ft. tree would be about 30 ft. over the top, from ground to ground, and another 3 feet at least must be added to allow for the 18-in. flaps on the ground. Many orange trees are greater in diameter than in height; for instance they may run 13 ft. in diameter, which will give a 41 ft, circumference approximately. To give such a tent sufficient circumference, two and a half widths (175 inches) would be necessary for each of the three sections, which will give a total circumference when made up of over 43 feet without the gussets.

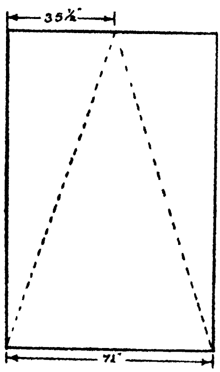


FIG 4
GUSSETS

Avoid Waste in Cutting.

It will be seen from Fig. 5 that after cutting the first section a V-shape is left in piece B. To avoid waste this must be ripped down from D to E, forming another partial width B[1]. The second section is then formed by placing B[1], A, C, and B in position as shown in Fig. 6. The three gussets for a tent of this size would be cut from a width and a half, thus adding 210 inches to the circumference at the bottom hem.

It will be noticed, in cutting this type of tent, that the top ends of the piece are cut at an angle of 60 degrees. The two when joined to make one section, as in Figs. 2 and 6, form an angle of 120 degrees, or the three sections make 360 degrees, and thus fit in when joined together as in Fig. 3. The angle of 60 degrees must be approximately adhered to; if greater, the seams will pucker when joined as in Fig. 3, while, if a more acute angle is used, the tent will be too sharp peaked and will not fit well over trees that are rather flat-topped, and some length of tent will be thus lost.

The "Wrench" Type of Tent.

Mr. Walter W. Wrench, at one time a citrus-grower on a large scale in Kenthurst district, designed and extensively used another form of tent. His son has kindly supplied the Department with the following particulars:—A circle is first cut from two widths of material. If 72-in. stuff is used this, when sown, will give a circle of about 11 ft. 8 in. diameter, and

a circumference of about 36 ft. 8 in. On to this circumference is pleated a 45-ft. length of half-width stuff. Then on to the 45-ft. edge is seamed two 22-ft. 6 in. lengths of full width stuff; the ends of these lengths are joined by two gussets, each 2 feet wide.

This tent would be 29 ft. 2 in., or say 29 feet from the bottom hem over top of the tree to the bottom hem on the other side. Deducting 3 feet to allow for the 18-in. flaps on the ground, this would leave 26 feet, which should cover a 10-ft. orange or a 10 ft. 6 in. tree at a pinch.

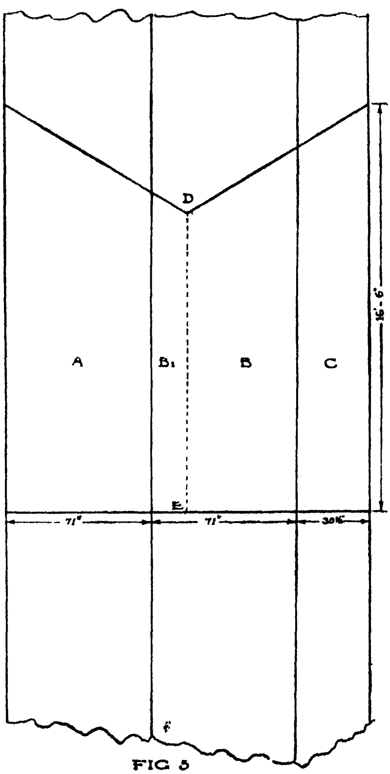


FIG 5

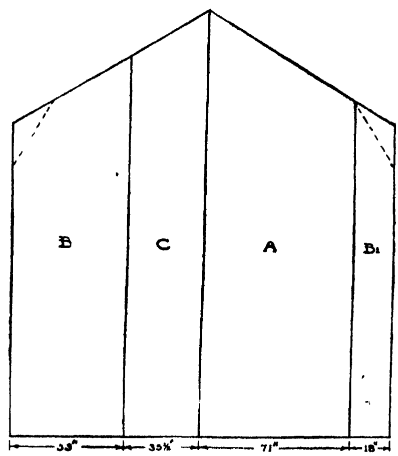


FIG 6

Its shape and width at the bottom (49 ft.) make it a very handy tent to use. It has a slight drawback in that the pull comes *against* the grain and seams, and the strength is therefore not so great as when the pull is *with* the grain and the seams, as is the case with the "dome" type of tent.

Modified "Wrench" Type of Tent.

The tent last described can be strengthened somewhat however by slightly altering the construction in the following manner:—Cut a circle from two full widths as previously mentioned, and on to this circumference join four 9 ft. 3 in. lengths of half-width material; join the ends of

these four pieces by four gussets each 24 inches wide at the bottom, to make up total outside circumference of these half-width lengths to 45 feet.

On to this 45-ft. circumference join four 11 ft. 3 in. lengths of full-width material, joining their ends with four gussets each 12 inches wide at the bottom, making the total outside circumference 49 feet. The 24-in. gussets should be cut from about a 4-ft. length of material, and the 12-in. gusset from about a 7-ft. length of material, so that the peak-ends will lap on to the piece above. All gussets should be cut with the grain of material running from the centre towards the circumference of the tent. The 12-in. gussets should join on to the corresponding 24-in. gussets so that the pull will come direct right through. So as to avoid waste when cutting the 24-in. and 12-in. gussets from reputed 72-in. material, the gussets can be cut slightly under-size so that one width of 72-in. material will cut three pairs of the wider gussets and six pairs of the narrower gussets. A saving can be made when cutting the circle from two equal widths of material, if after cutting one circle, the remaining lengths of material are so placed so as to bring the peaks together in the centre before cutting the next circle.

Tents or Sheets—Which?

A tent takes less material to make than a sheet to cover the same sized tree. The tent shown in Figs. 5 and 6 is 16 ft. 6 in. vertical, which would give 33 feet from hem to hem over the top and would take about 35 yards of 72-in. material to make. A 33 feet octagonal sheet would take about 53 yards of 72-in. material, a difference of 18 yards, which at 4s. a yard, means an extra £3 12s. However, there are limits to the size of trees on which tents can be at all conveniently used as already mentioned, moreover there is no doubt that sheets are more easily and quickly handled. Whether the saving in time in operating will make up for the greater capital outlay depends on circumstances. The saving of time is more pronounced when large gangs rather than smaller ones are at work. For these reasons a contractor will generally favour sheets. The contractor, too, can allow for depreciation of plant when submitting prices for his work, thus passing on the cost of his outfit to the grower.

The larger grower also may find it economical to use the more expensive sheet outfit, but there are many small growers who might find it difficult to pay for sheets, and as they are operating the tents themselves, perhaps with the help of one regular paid hand or by some reciprocal arrangement with a neighbour, they do not notice the extra working cost. In other words they can spare the time more conveniently than they can spare the cash.

Make Your Own Sheets.

Sheets are made octagonal because the corners of a square sheet are useless when put over a tree. The corners, therefore, are a needless cost in material and an extra weight to handle. The size required is

ascertained by placing a tape over the top of the tree and measuring from ground to ground and adding at least 3 feet to allow not less than 18 inches for flaps on the ground—a wider flap is an advantage. The width then obtained will be the distance square across from one side to the opposite and parallel side of the octagon, and not diagonally across from angle to angle.

Probably the easiest way to pattern an octagonal sheet is to lay out the required octagon full size on a smooth piece of ground or on the floor of a shed if one of sufficient size is available.

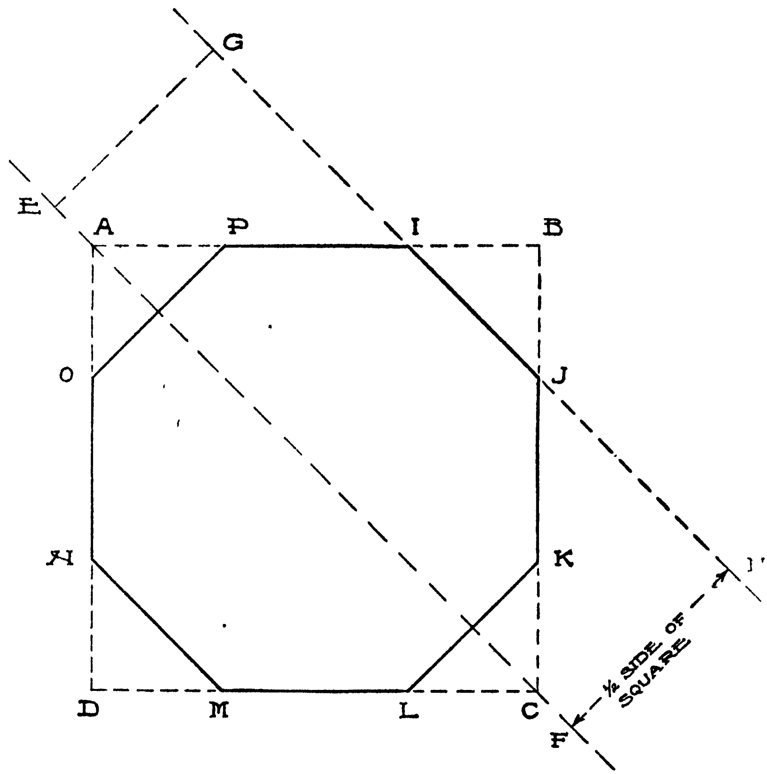


FIG. 7.

Lay out a square the size it is intended to have the width across the sheet. This can be done with a builder's large wooden square or by means of the thirty-forty-fifty triangle (see leaflet "Laying-out and Planting an Orchard," obtainable free from Under-Secretary, Department of Agriculture, Sydney). The square can be marked by driving in 6-in. or 7-in. nails at A, B, C, D, Fig. 7, and stretching a cord round them; stretch another cord from EF so that it will cut points A and C; E and F are preferably placed at a distance beyond A and C as shown in Fig. 7. From E and

F measure off half the side of the square to G and H, stretch a line from G to H which will cut the square at I and J. Mark I and J with nails then measure off the distance IB from A to P, and A to O, and from D to N, and D to M, and from C to L, and from C to K, marking all these points with nails. Stretch a cord round the nails at I, J, K, L, M, N, O and back to P, which form the octagon, then remove all other nails.

The calico or duck can then be laid down piece by piece and cut according to the sides of the octagon marked by the stretched cord. After cutting a piece the angle left on the remaining length of material can be made use of by reversing it and thus avoiding waste. The pieces should overlap about ½-inch to allow for seams. When the pieces are seamed together the outside edges should be trimmed even and hemmed.

Materials for Tents and Sheets.

Tents.—The modified Wrench type of tent described above—29 feet overtop and 49 feet in circumference—takes approximately 37 yards of 72-in. material.

The "dome" type of tent—29 ft. overtop, 49 ft. 7 in. in circumference (1½ width gussets)—takes approximately 30 yards of 72-in. material. The same type of tent, 29 ft. overtop, and 46 ft. 8 in. in circumference (single-width gussets), takes approximately 29 yards of 72-in. material; and one 33 ft. overtop 52 ft. 6 in. in circumference (1½-width gussets) takes approximately 35 yards of 72-in. material.

Octagonal Sheets.—The following tabulation shows the quantities of 72-in. material required for octagonal sheets of various sizes:—

Sheet	40 ft. x 40 ft.	requires	approximately	74 yards.
„	45 ft. x 45 ft.	„	„	99 „
„	50 ft. x 50 ft.	„	„	122 „

The above measurements for tents and sheets presume that we obtain 70 inches when so called 72-in. material is made up, and when parts of width are used these parts only are calculated, as the remainder of such widths are used to make the next tent or sheet. The above sizes of sheets all cut to portions of widths, but the orchardist may prefer to fix the size of the sheet to take a certain number of whole widths.

Prices of calico fluctuate, but a calico suitable for tents and small sheets can be obtained at about 4s. per yard. A poorer calico, and one that is only just fit for fumigation tents, can be obtained at about 3s. per yard. Close-woven duck should be used for large sheets. Care should be taken that the duck is closely woven as some material of the class, though strong enough is too open.

Softgoodsmen generally make a slight reduction when selling by the dozen yards, and when purchasing large quantities the opportunity should be taken of pressing for a further reduction.

Conclusion.

It is desirable again to emphasise the following points:—(1) When measuring the distance over a tree be sure that the full measurement is taken, and that the tape is not taking a short cut anywhere through the foliage. (2) Have the tents or sheets of ample size and allow for the growth of the tree during the life of the tent or sheet. Remember that young trees increase in size more rapidly than old ones. As orange trees become older they generally increase in circumference more than in height. (3) The life of tents or sheets depends largely on the care given them. If acid is being used, take every precaution that it does not get on the tent or sheet. (4) Be sure that tents or sheets are perfectly dry before being folded and put away. Hang them out on a sunny day when the atmosphere and the ground underneath are dry. Fold them up and put away while the sun is still high, and protect them while in store from mice or rats.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.
St. Ives (F. Conway)	Jan.	13, 14
Dapto (E. G. Coghlin)	,,	13, 14
Bangalow (W. H. Reading)	,,	25, 26
Moruya (H. P. Jeffery)	,,	27, 28
Eden (H. P. Wellings)	Feb.	9, 10
Wollongong (W. J. Cochrane)	,,	9, 10, 11
Gosford (E. H. Fountain)	,,	10, 11
Tahmoor (E. S. Key)	,,	10, 11
Leeton (W. Roseworn)	,,	14, 15
Pambula (L. K. Longhurst)	,,	15, 16
Cessnock (D. B. McGilvary)	,,	16, 17, 18
Castle Hill (W. H. Taylor)	,,	17, 18
Newcastle (E. J. Dann)	,,	21 to 25
Uralla (D. G. Evans)	,,	22, 23
Gunning (G. E. Ardell)	,,	23, 24, 25
Blacktown (J. McMurtrie)	,,	24, 25
Kangaroo Valley (L. W. Vance)	,,	24, 25
Dorrigo (J. H. Skooch)	,,	28, 29
Inverell (E. A. Clarke)	,,	28, 29, Mar. 1
Tumut (H. Mount)	,,	29, Mar. 1
West Maitland (M. A. Brown)	,,	29 to Mar. 3
Nabiac (E. A. Carey)	Mar.	1, 2
Bellingen (J. F. Reynolds)	,,	1, 2
Robertson (J. K. Hamilton)	,,	2, 3
Nimmitabel (R. Draper)	,,	5 to 8
Tumbarumba (M. Kinstler)	,,	6, 7
Nimbin (S. H. Kilminster)	,,	7, 8
Walcha (A. D. Murchie)	,,	7, 8
Braidwood (R. L. Irwin)	,,	7, 8
Yass (C. N. Howard)	,,	7, 8, 9
Taree (R. Plummer)	Mar.	7, 8, 9
Moss Vale (W. Holt)	,,	8, 9, 10
Rydal (H. Murray)	,,	9, 10
Gundagai (P. J. Sullivan)	,,	13, 14
Crookwell (P. R. Marks)	,,	13, 14, 15
Armidale (A. McArthur)	,,	13 to 16
Mudgee (O. Watkins)	,,	15, 16, 17
Orange (G. L. Williams)	,,	20, 21, 22
Tamworth (E. E. Upjohn)	,,	20, 21, 22
Quirindi (G. Curtis)	,,	21, 22, 23
Kempsey (N. W. Cameron)	,,	21 to 23
Goulburn (T. Higgins)	,,	22, 23, 24
Blayney (J. H. Moore)	,,	27, 28
Batlow (C. S. Gregory)	,,	27, 28
Coonabarabran (C. D. Cox)	,,	27, 28
Molong (W. P. Stanger)	,,	27, 28
Muswellbrook (R. C. Sawkins)	,,	27, 28, 29
Sydney Royal (G. C. Somerville)	April	2 to 11
Narrabri (W. A. McDonald)	,,	18, 19
Wee Waa (D. B. Martyn)	,,	24, 25
Wingham (D. Stewart)	,,	25, 26
Grafton (L. C. Lawson)	,,	25 to 28
Forster (W. Poppenhagen)	,,	27, 28
Casino (P. W. Swanson)	May	1, 2, 3
Kyogle (D. Campbell)	,,	9, 10
Gresford (A. R. Brown)	,,	11, 12
Narandera Sheep Show	July	18
Wagga Wagga (F. H. Croaker)	Aug.	21, 22, 23
Junee (G. W. Scrivener)	,,	28, 29
Ganmain (C. C. Henderson)	Sept.	11, 12
Narandera (J. D. Newth)	Oct.	9, 10

WHEAT plants demand a soil condition where the under layers are so tightly packed that the growing roots have to force their way between the particles, and if for any reason this does not exist, full growth is not made. As a matter of fact, if the growing roots of plants reach open spaces in the soil, the plants receive a check to their growth, and in many cases it is so severe that they are unable to recover properly from it.—W. J. SPAFFORD, in the South Australian *Journal of Agriculture.*

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	G. C. Chapple, "Ondiong," King's Vale.
Canberra	E. J. Johnson, "Iona," Gunningbland.
	Quirk and Everett, "Narrawa," Wellington.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	W. W. Watson, "Woodbine," Tichborne.
Clarendon	E. J. Johnson, "Iona," Gunningbland.
Currawa	Quirk and Everett, "Narrawa," Wellington.
Federation	E. J. Johnson, "Iona," Gunningbland.
	H. Owen, "Apple Grove," Duri.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. W. Watson, "Woodbine," Tichborne.
Gresley	E. J. Johnson, "Iona," Gunningbland.
Marshall's No. 3	A. E. Kinghorn, Farm 1445, Murrami.
Merredin	T. W. O'Brien, "Cooberang," Junee Reefs
Nabawa...	Cullen Bros., Bunglegumbie, Dubbo.
Riverina	Quirk and Everett, "Narrawa," Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
Turvey	Quirk and Everett, "Narrawa," Wellington.
	E. A. Michael, Hill View, The Rock.
Waratah	E. J. Johnson, "Iona," Gunningbland.
	P. Page, Duri.
	Quirk and Everett, "Narrawa," Wellington.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	W. Waite, Finley
	W. J. McGrath, Avon, The Rock.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	G. G. Ballantine, "Clifton," Ariah Park.
	J. McGrath, "Berra Lea," Goonimbla.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	W. W. Watson, "Woodbine," Tichborne.
	Chaffey Bros., Nemingha.
Yandilla King	A. E. Kinghorn, Farm 1445, Murrami.
	P. Gaynor, "Underwood," Ariah Park.
	A. A. Groves, "Aberfeldie," Barmedman.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	Quirk and Everett, Narrawa, Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	G. C. Chapple, "Ondiong," King's Vale.

Oats—	
Mulga	Chaffey Bros., Nemingha.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
Maize—	
Golden Glow	P. Kelly, Leech's Gully, Tenterfield.
Fitzroy...	Manager, Experiment Farm, Grafton.
Broom Millet	W. T. McDonald. Taree Estate, Taree.
Sweet Sorghums—	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	D. Shearer and Sons, Glendon, via Singleton.
White African...	Principal, H.A. College, Richmond.
Peanuts—	
Large White Spanish... ...	Manager, Experiment Farm, Grafton.
Soybeans—	
Biloxi	Manager, Experiment Farm, Grafton.
Otootan	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The History of Nabawa Wheat.

The records of Mr. J. T. Pridham, Plant Breeder, show that this wheat resulted from the mating of Gluyas Early with Bunyip at Wagga Experiment Farm in 1908, the crossing being done by Mr. R. J. Hurst under the direction of Mr. G. L. Sutton, who was at that time an officer of this Department. The seeds obtained from the cross were sown in 1908 at Cowra Experiment Farm, and the second generation seed was divided up between the following experiment farms in 1910:—Cowra, Wagga, Bathurst, Glen Innes, and Hawkesbury Agricultural College. At the first three farms it was heavily infected with bunt, as the practice then was with new crossbreds to determine their susceptibility to this disease. The cross proved bunt-liable at Cowra, extremely so at Bathurst, and rust-liable at Hawkesbury Agricultural College. The third generation seed was sown in 1911 at Cowra, Wagga, Bathurst, Glen Innes, and Nyngan experiment farms and Hawkesbury Agricultural College, and Mr. Sutton, leaving this State early in that year, presumably took seed with him and placed it in Western Australia. The cross was not bunt-infected that year at Cowra, but was rejected on the score of insufficient yield. In 1912 it was sown at Wagga and Bathurst experiment farms, and from 1913 to 1915 inclusive it was sown at Wagga Experiment Farm only. It was then dropped as being not particularly productive.

In May, 1919, we received a sample of Nabawa from Mr. Sutton from Western Australia, and Mr. Hurst at Wagga Experiment Farm recognised it as the Early Gluyas x Bunyip grown in previous years. Some time ago I noted in the Western Australian *Journal of Agriculture* that Mr. W. M. Carne, of that Department, had discovered that Nabawa is highly resistant to flag smut, and as this disease has become serious with us, we obtained seed from Western Australia to determine whether the wheat would be of value to us.

It will be seen from the above that the credit for the foundation of Nabawa wheat lies with New South Wales, but that for its evolution as a wheat suited to Western Australian conditions and the discovery of its flag smut resistance, the Western Australian Department of Agriculture is responsible.—A. H. E. McDonald, Director of Agriculture.

Poultry Notes.

January.

E. HADLINGTON, Assistant Poultry Expert.

INQUIRIES are frequently received as to the advisability of late summer or autumn hatching. The question is one which cannot be answered without qualification, and for this reason it is proposed to deal with some aspects of the matter, to enable those contemplating hatching early in the year to decide if their conditions are such as to render this course a safe one.

The Limitations of "Autumn Hatching."

From the point of view of receiving a payable price for the cockerels hatched at this time, there should be no doubt as to satisfactory results, if they are marketed at the right age. Even under ordinary conditions there is a good demand for cockerels from April onwards, but, judging by the prices now being obtained for prime cockerels, it would appear that there is likely to be a better demand than usual this year for autumn-hatched birds. The outlook with regard to the pullets is somewhat different, for the reason that they will not be found as good layers as those hatched in the spring, and as hens they will not lay as consistently. So much for the prospects of these autumn-hatched birds being profitable.

The next consideration is whether the circumstances or equipment on a farm render it wise to attempt such hatching.

Points to Consider.

On no account should autumn hatching be attempted if the rearing equipment has not been thoroughly cleaned up, and had at least a couple of months' spell. Then, again, the hatching should not be prolonged beyond the middle of March, so that another two or three months elapses before the spring hatching. As a matter of fact, the only safe course for those intending to hatch regularly in the autumn is to have separate rearing equipment altogether, leaving the spring-rearing plant to spell from the end of each spring hatching to the next. It will thus be seen that this out-of-season hatching cannot be entered upon without proper provision being made.

There are circumstances which may render it desirable to rear a batch of chickens at this end of the year, such, for instance, as where it has not been possible to carry out hatching operations to the extent desired during the regular season, or, again, where a farm has been taken up too late for the spring rearing. Under these conditions a short hatching during the autumn, beginning any time after the middle of January, will save the loss of six months.

Assuming, then, that all the foregoing aspects have been considered, and an autumn hatching has been decided upon, the next question is the supply of eggs for hatching. In this connection, a proper choice of breeding stock

is essential, and difficulty will be experienced in making a selection. Only birds which are not in moult can be used, and preferably those which have had a short rest from laying, as birds that have been laying heavily all through the flush season are not the sort to produce strong chickens. Then, again, a greater percentage of eggs will have to be rejected on account of size and quality of shells than would be the case in the spring, and the percentage of hatchings will not be as high.

Thus, to hatch extensively it is necessary to have a large flock of layers from which to select breeders.

Chicken Pox, or Warts.

Any time from this month onwards chicken-pox may make its appearance among unprotected flocks; in fact, a case has already come under notice. From time to time a method of protecting young stock against chicken-pox has been given in these notes, but it is found that in many instances the treatment recommended is not properly carried out, with the result that it is not altogether effective. It should be remembered that chicken-pox is a blood disease; therefore, to prevent it, or at any rate minimise the severity of an attack, the logical course is to purify the blood of the birds to increase their resistance.

It has been proved conclusively over many years that this can be achieved by the regular and systematic use of flowers of sulphur and epsom salts, given as prescribed below:—A tablespoonful of flowers of sulphur for the equivalent of every fifty adult birds should be given in the morning mash *every third day for a period of three weeks.* Then this should be stopped, and for the next three weeks Epsom salts should be added every third day to the drinking water at the rate of 1 ounce to the gallon. At the end of the three weeks stop the Epsom salts and return to the flowers of sulphur in the mash, and continue alternating the treatment until the period is passed over which chicken-pox is seasonable.

It is emphasised that the full protective benefit of the flowers of sulphur will not be obtained unless the advice given is carried out in its entirety, but in order that no misunderstanding may arise it may be stated in terms of weight for weight. To every 7 or 8 lb. of the mash, whether wet or dry, 1 ounce of sulphur should be mixed; commencing well ahead of the time when the disease is liable to appear, and continuing till the season is over—which means that it is advisable to commence the sulphur treatment in this State in the first week of January, and to continue it in alternation with the Epsom salts until about April.

In using dry mash the sulphur should only be given every third day, the same as for the wet mash.

It is sometimes averred that this treatment is not effective because some birds become affected, but what is not realised is the fact that if no precautionary measures had been taken the whole flock might have been stricken with the disease, resulting in a complete break-up and consequent loss of production for some months.

It is known that even where the treatment is carried out faithfully there may be a few isolated cases of the disease, but those who have observed a flock in the grip of chicken-pox will appreciate the difference between a few birds lightly attacked and the havoc that can be wrought by the disease in an unprotected flock.

Ensuring Quality of Eggs.

It is gradually but surely becoming recognised that, on the whole, the quality of eggs being distributed to the public leaves much to be desired, and the time has arrived when it is imperative that better methods be instituted in the handling of this important commodity through all stages, from the farm to the consumer. True, some improvement has taken place during the past year or so, and this has undoubtedly been the result of propaganda, which has called attention to the subject. But if a desirable standard is to be attained there must be concentration of effort: first on the part of the farmer, second, by the agents, and last, but by no means least, by the distributing stores.

Such effort may be nullified at any one point by slackness at another, therefore the co-operation of all three is essential to achieving the objective of supplying better quality eggs to the public.

For instance, the farmer may do everything that is possible to preserve the quality of the eggs as laid, but this would be of no avail if they are badly handled after they leave the farm. That being the case, it is appropriate that we should point out the main factors which go towards ensuring sound quality eggs. These may be taken in their natural sequence from the point of production to consumption.

Production of Eggs.

It should be realised that the quality of the eggs when laid depends very largely upon the stamina and physique of the hens which lay them, as these factors influence the density of albumin, colour of yolk, and quality of shell.

Next comes the feeding, which also plays an important part. For instance, if only wheat and wheat products are fed to the fowls, the quality of the albumin and colour of yolk will be adversely affected. Whereas, if a proportion of maize and an adequate supply of green feed is also given, an improvement in both will be noted; on the other hand, if an excess of green feed is constantly given, the density of the albumin will be reduced. An adequate supply of suitable shell grit is essential to sound shells. In this connection there is a great variation in the quality of shell grit, and if it is not of the right class the birds will not eat sufficient to supply their requirements.

Factors on the Farm.

Assuming that the feeding and general management of the birds are satisfactory, there are other factors which could cause deterioration on the farm. For example, if eggs which are fertile are allowed to remain in the nests

under broody hens, or when collected are not kept in a temperature below 98 degrees Fah., incubation may commence, and bad eggs would result. As a matter of fact, all eggs should be collected twice daily, and kept in as cool a place as possible from the time they are laid till they are consumed; because if eggs, whether fertile or not, are allowed to remain for long in a heated room the contents shrink, and the albumin becomes liquified. Again, exposure to winds or draughts will cause shrinking. For this reason, the sooner the eggs are packed into the cases after they have cooled down the better, and in the summer the cases should be placed in the coolest room available. On no account should eggs be allowed to remain in an open shed without a covering sheet.

Cleanliness of eggs, too, is another important factor in retaining quality. In this regard, close attention to the nests is necessary to keep them clean, also the houses. Herein lies the advantage of semi-intensive houses, which, if provided with ample scratching material, assist in keeping the eggs clean, especially in wet weather, when the birds can be kept shut in. By taking precautions to keep the eggs clean, much work is saved in washing, and moreover washed eggs do not keep as well.

Marketing.

Next comes the question of sending to market. Unfortunately, many farmers do not send their eggs to market twice weekly. The result is that unless such eggs are passed on to the consumer without delay they are stale by the time they reach the housewife. This naturally results in distrust of purchased eggs, and consumption is thereby retarded.

Therefore, in the interests of all concerned, the farmer should regard the marketing of eggs twice a week as an absolute essential. As a matter of fact, the time is not far distant when all consignors who do not market their eggs thus will receive a lower price for them; because what is now being done with regard to testing and repacking eggs for export must in the near future become a general practice for all eggs coming into market. Only then will guaranteed eggs be assured to the public—and the careful farmer reap the benefit, and the careless one be penalised by receiving a lower price for his eggs.

Packing and Grading.

The prevention of breakages is a matter in which the farmer can materially assist, and in this regard there is still room for improvement. For instance, it is a common thing to see cases of eggs on agents' floors, without any padding or buffer, on top or bottom, or any side padding where the fillers fit loosely in the cases. Then again, large and elongated eggs are often placed in the middle of the fillers instead of around the sides of the top filler, or in the same position in the fillers underneath, if they can be packed so as not to project above the cells. The main thing is to have no eggs standing above the filler, because the weight of the eggs above will cause breakages.

The necessity for correct grading is becoming more fully recognised, and much improvement has taken place in this regard, but there are still cases in which a reminder as to what is required for the local market would not be amiss. The three existing weight grades are as follows:—

First grade—Average 2 oz. No eggs to be less than 1¾ oz.
Second grade or medium—Eggs between 1¾ oz. and 1½ oz.
Third grade or pullet eggs—All eggs below 1½ oz.

Agents' Part.

No matter how perfectly the eggs are handled on the farm, there is no guarantee that they will reach the consumer in a fresh condition, unless they are just as carefully treated after they are despatched from the farm. Should they be kept exposed in transit on a hot day, or be allowed to stand for a week or more on the agent's floor awaiting sale, deterioration will take place, and all the care of the farmer will go for nought. Therefore, responsibility rests upon the agent to see that the conditions under which eggs are handled while on his floor are such as not to injure the quality.

The Retailer.

The last stage through which eggs pass before reaching the housewife leaves much to be desired, especially in the case of grocers and smallgoods shops. Here good eggs are very often kept under most unsatisfactory conditions—frequently exposed to the sun or allowed to stand in the open for many days—that it is little wonder complaints are heard about the quality of eggs. Unfortunately, it is the farmer who usually gets the blame in such cases, though he is really in no way responsible.

Thus, to ensure good fresh eggs to the public there must be proper and systematic handling in all channels through which they pass. This would in turn lead to increased consumption of a most valuable article of food, and would reduce the surplus that has now to be exported.

Silage on an Irrigated Farm.

We have often been asked by visitors at the State Research Farm if there is any need for conserving green fodder as silage at Werribee, where green food is available to stock on the irrigation fields twelve months in the year. To such a question we are able to answer that well made silage is much more palatable and nourishing to stock than is green food in a watery stage of growth—a condition often met with during the early growth of crops or grasses. Again, the cost per ton of harvesting crops when at their summit of growth is low compared with the daily cost of cutting and carting to stock the required green feed ration for the day during all stages of growth. This is apart from the great convenience of having suitable stock food readily obtainable when it is most needed.—H. C. Wilson, in the Victorian *Journal of Agriculture.*

Orchard Notes.

JANUARY.

C. G. SAVAGE and W. le GAY BRERETON.

THE rains during November and December gave the soil a soaking which was much needed in many fruit districts. Unfortunately some of the falls split some of the ripening cherries, and on the coast the protracted light drizzle set up conditions favourable to the development of brown rot. In some places the frequent showers repeatedly stopped the cultivators and consequently weed growth got away. In such instances it will be necessary to give a shallow ploughing to kill the weeds and put the land in such condition that it will catch and retain any future falls of rain. Immediately beneath the trees where horse implements cannot reach hand tools must be used to keep down the weeds.

The soil should be kept in a loose condition free from weeds until the time is approaching to start the autumn ploughing, or in districts in which the rainfall is sufficient or where irrigation is available until it is time to sow a green manure crop in February or at the latest early in March. In such cases steps should be taken to procure the seed at once, with the object of getting the crop well established early so that it may be ready to be turned under by midwinter. To leave a crop growing later than midwinter is to take too great a risk. The crop should be given a start by the application at the time of sowing of a fertiliser such as superphosphate or a mixture of equal parts of superphosphate and bonedust.

Budding.

Since the rain the sap should be running freely, and the present month is likely to be most suitable for budding both old trees and nursery stock. Old trees which were cut back at the end of the winter with a view to being worked just now should by this time have made plenty of young shoots mature enough to bud into. It is by far the best policy to work many more of these young shoots than will be required for the ultimate formation of the new tree, as there is likely to be some loss from heavy winds and other causes. Moreover, the leaf surface of the tree was very much reduced by the cutting back in the winter, and it is to the benefit of the tree to allow as much new foliage to grow as possible. The development of shoots from several points round thick stumps keeps the bark healthy all round, whereas if only a few shoots spring from one side the bark often dies away on the other side. The thinning out of superfluous shoots can be spread over several years as fully explained in the leaflet, "After-care of Buds and Grafts."

Pests.

Do not let up in the warfare against codling moth. Midseason apples and pears will probably have received their last application of lead arsenate spray before picking, but in some cases it may be wise to continue applications of this spray on late varieties.

There are many other points to look to besides spraying, however. Guard against outside infection from return or second-hand cases; attend to the bandages regularly; collect all infected fruit at frequent intervals and destroy it at once by boiling.

Fumigation.

January is the commencement of the best season for dealing with scale insects on citrus trees. Care should be taken in the use of calcium cyanide that has been held over from the previous season. If the containers are nearly full and have been kept hermetically sealed the material should be practically as good as when purchased. But a small quantity held in a large container for several months may have had sufficient air in the container to reduce the strength of the calcium cyanide appreciably. As there is no ready way of ascertaining to what extent depreciation has gone on, it is best when using these small quantities of held-over material, to increase the dose very considerably and to avoid the chance of injuring by blowing it on to the ground under the tent and not through the tree.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Yanco Agricultural High School ...	26	12 Jan., 1928
A. V. Chaffey, "Lilydale," Glen Innes	15	25 ,, 1928
New England Girls' Grammar School, Armidale	17	30 ,, 1928
Lunacy Department, Kenmore Mental Hospital	99	1 Feb., 1928
Walaroi College, Orange	4	3 ,, 1928
Lunacy Department, Orange Mental Hospital	8	7 ,, 1928
Australian Missionary College, Cooranbong	51	11 ,, 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 ,, 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	80	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	88	11 ,, 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ..	70	16 ,, 1928
Department of Education, Mittagong Farm Homes	80	22 ,, 1928
Sacred Heart Convent, Bowral	11	23 ,, 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 ,, 1928
Dominican Convent, Moss Vale	4	24 ,, 1928
Kyong School, Moss Vale	2	8 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone ..	113	20 ,, 1928
Marist Brothers' Training School, Mittagong	80	25 ,, 1928
Blessed Chanel's Seminary, Mittagong	3	26 ,, 1928
Hygenic Dairy Company, Glenfield Farm, Casula, Liverpool ...	94	19 Oct. 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 ,, 1928
Department of Education, Hurlstone Agricultural High School ...	83	10 ,, 1928
Department of Education, Eastwood Home	16	16 ,, 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 ,, 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 ,, 1928
Lunacy Department, Callan Park Mental Hospital	20	26 ,, 1928
Miss Brennan, Arrankamp, Bowral	24	29 ,, 1928

—MAX HENRY, Chief Veterinary Surgeon.

CONTENTS.

VOL. XXXIX. PART 2. FEBRUARY 1. 1928.

Agricultural Gazette of New South Wales.

Championship Field Wheat Competitions.

THE JUDGES' REPORTS.

CENTRAL SOUTH-WEST WHEAT AREA.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE agricultural societies which conducted local competitions within this division were Ariah Park, Ardlethan, Barellan, Burrowa, Canowindra, Cootamundra, Cowra, Eugowra, Grenfell, Illabo, Murrumburrah, Quandialla, Temora, West Wyalong, and Young.

The total of sixteen entries was three less than the number of societies entered in the previous competition in this division, and the decrease is due to the very adverse season experienced in the western districts; in fact, it is most gratifying that, under the circumstances, the entries were so satisfactory, and any falling off in number is not in any way due to lack of interest, for never before has greater enthusiasm been shown.

The Season.

Drought conditions prevailed to such an extent in the western districts of the division that seed sown in April in many instances did not receive sufficient rain to germinate it until October. Coming eastward conditions gradually improved, and sufficient rain fell in May to ensure a satisfactory germination. During the succeeding four months, June to September, the rainfall was much below normal, and only light showers of very little service were registered, and as a result much of the crop in some of the largest wheat-growing districts of the State definitely failed or was fed off with sheep. In districts situated in the eastern portion of the division the crops were able to hold on until their success was assured by beneficial rain, which fell most opportunely during the closing days of September and the beginning of October. These rains were succeeded by further good falls in October and early November, and as a result crops which seemed to be doomed to failure were transformed into heavy yielding ones. One result of the peculiarities of the season is that many crops after the October rain made good second growth, which was quite green when the main crop had ripened. This caused a delay in harvesting, and in the meantime grain was lost from the ripe portion of the crop by shedding.

The Leading Crops.

The particulars of the prize-winners are as follows:—

D. Murphy, Longview, Sebastopol (Temora Society) 1

W. J. Coddington, Granite View, Murrumburrah (Murrumburrah Society) 2

F. C. Rowland and Sons, Werribee, Wangoola (Cowra Society) 3

Details of the awards and of the culture of each competitor's crop are shown in the accompanying table.

The entry which won the championship was a heavy pure crop of Waratah, estimated to yield 37 bushels per acre. The ears were not large, but it was so tall and dense that it had lodged in patches. The success can be attributed both to the excellent cultural methods and to the practice of crop rotation. A definite system of rotation of crops—fallow-wheat-oats—is followed, and probably this fact is responsible for the very small infection of flag smut, although the lateness of the sowing may have also been a contributing factor. It was necessary, however, to penalise the crop for the presence of black oats.

The second-prize crop comprised 30 acres of Bena and 20 acres of Waratah, which was tall and fairly dense, and with well-developed heads. It exhibited a weak straw, as the result of which the crop was tangled; a quantity of grain had already been shed at the time of judging, although the crop was not quite fit to harvest, and it was judged that a yield of 37 bushels per acre would be stripped. On the score of purity very little fault could be found, and but for a slight infection of septoria and loose smut disease was absent. Points were lost for the presence of black oats, saffron thistles, and undergrowth, for which there was some excuse, as the land had previously produced about thirty crops.

Waratah again figured as the third-prize winner. It was an even, dense crop with good full grain, but the ears were not large. Harvesting was delayed owing to second growth, and the ripe heads were shedding; the apparent yield was anticipated to be 34 bushels per acre. The crop was pure and fairly free from disease, only a little flag smut and take-all being present. Black oats and saffron thistles cost the crop a reduction of points.

Lessons from the Competition.

Fallowing.—Speaking generally, the fallowing methods adopted by the competitors were of a high standard, consistent with the peculiarities of the different districts and the season. The land was ploughed early, cultivated deeply in spring and to a shallow depth in autumn prior to sowing; in districts where good rains were recorded in December and January these were bottled up by cultivations succeeding the rainfalls.

The depths of ploughing varied from 3 inches to 5 inches, and while the variation may be regarded as wide, yet the depths in the case of both extremes were quite justified, for this is a matter for which no standard can be fixed. The depth of ploughing should be regulated according to the nature of the soil, the rainfall of the district, and the time of ploughing. The aim should be to provide for the complete compaction of the ploughed soil before the sowing period; some soils, such as those of a self-mulching nature, are difficult to compact, and should therefore be ploughed shallow. Furthermore, as rain is the most effective agent in compacting the soil, it follows that the less rain that is likely to fall on the fallow the more shallow

should be the cultivation. There is a diversity of opinion as to whether the initial spring cultivation of the fallow should be performed by the harrows. The great value of the use of this implement is the creating of a mulch in the least possible time, for any delay in checking evaporation at this period is at the expense of the soil moisture. It also prepares and pulverises the soil that will by the subsequent working with the cultivator be sifted and form the sub-surface layer, which in its ideal condition should be finely and firmly compacted.

Varieties.—The results of this competition must be regarded as a veritable triumph for the Waratah variety; not only has it carried off the championship and third prize and comprised portion of the second prize crop, but it is represented in the first eleven crops placed in order of merit, with the exception of that filling ninth place.

In spite of its success, it cannot be regarded as being at its best this season, for most crops, in common with other early-maturing varieties, suffered by reason of a small ear, due to dry, frosty conditions prevailing at the stage when the crop commenced to spindle. As in the previous year, Waratah has exhibited a tendency to shed its grain, but even though it may lose a bushel or two it is still so prolific that it can outyield most other varieties. This defect was more pronounced owing to the delay caused to harvesting as the result of the secondary growth, but it would be inadvisable to risk sowing very large areas with a variety that does not hold its grain satisfactorily.

Waratah is rapidly taking the place of Canberra, which has lost its popularity owing to its susceptibility to flag smut and loose smut.

Bena has shown its capacity as a yielder in the eastern portion of this division. This variety also does not hold its grain firmly, and grain was lost by shedding.

Seeding Operations.—The period of sowing the competing crops extended from the last week in March to the second week in June, but apart from the two sown in the extreme dates, the crops generally were sown seasonably. The best sowing period under average conditions is considered to be from the last week in April to the end of May, but where it is intended to sow a larger area it is sometimes necessary to commence sowing earlier and to extend the sowings into June. It may be good practice with an early rainfall to sow early, but except for very early districts March is considered to be too early, for it encourages the over-production of straw at the expense of grain, and the crop is prone to lodge and give trouble in harvesting. Too early sowing also does not allow an opportunity to destroy black oats and other weeds which grow concurrently with the wheat crop. Moreover, such early-sown crops are more subject to flag-smut infestation.

As regards the other extreme, it was the champion crop which was sown in the second week in June; in fact, Mr. Murphy states that he gets best results from June sowings. This is quite understandable in his case, for the country at Sebastopol is undulating and the soil porous, so that after rain

DETAILS of Awards—Central South-west Area.

Name and Address of Competitor.	Local Society.	Variety.	Methods of Cultivation	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period, April to October.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. Maximum, 30 points	Freedom from Disease. Maximum, 30 points.	Evenness. Maximum, 20 points	Condition. Maximum, 10 points.	*Cleanliness. Max., 30 points.	Total Points.
D. Murphy, "Longview," Sebastopol.	Temora ...	Waratah ...	Fallowed 4½ inches June and July, harrowed twice after ploughing, springtoothed October, scarified January, harrowed mid-March, scarified mid-May and end of May.	Second week June.	lb. 70-75	lb. 112	10	ins. 12·76	37	19½	28½	18½	7½	25½	136½
W. J. Coddington, "Granite View," Murrumburrah.	Murrumburrah	Bena, 30 acres; Waratah, 20 acres.	Fallowed 4 inches July, springtoothed full depth November, and again 2½ inches in January.	Last week May.	65	80	Very old land.	14·11	37	19½	28½	18½	6	26	135½
F. C. Rowlands and Sons, "Werribee," Waugoola.	Cowra... ...	Waratah	Fallowed 5 inches August, harrowed after ploughing, springtoothed December and January, and again prior to sowing, harrowed after sowing.	Second week May	65	70	Very old land.	10·44	34	19	28½	19	8	26	134½
Maguire and Fehon, "Aorangi," Barmedman.	Barmedman ..	Waratah ..	Fallowed 3 inches June, July, springtoothed early September full depth, again late September, harrowed October, scarified December, harrowed early January, springtoothed late January, harrowed February and April.	21st May	80	100 low grade.	6	8·17	30	19	28	19	9	29	134
R. B. Black, "Braemar," Greenethorpe.	Grenfell ...	Waratah, 44 acres; Union, 6 acres.	Fallowed 4½ inches August, harrowed September, springtoothed end October, disced January, harrowed early March, and after sowing. Crop lightly fed-off mid-July.	24th to 25th May.	65	95	Old land.	11·48	33	18½	29	18½	8	27	134
S. J. Kanaley, "Hazeldene," Junee.	Illabo	Waratah ...	Fallowed 4 inches July, harrowed August, springtoothed full depth, October, scarified end February, harrowed after sowing.	18th May	70	90	12	...	32	18	28½	19	8½	27	133

H. C. Thackeray, "Makari," Young.	Young... ...	Waratah ...	Fallowed 4½ inches July, harrowed September, scarified October and January, harrowed February, scarified before sowing. Crop fed-off lightly in June.	Mid-May	65	56	12	...	28	19½	29	19	8½	26½	130½
H. J. Balcombe, "Tekooma," Cranbury.	Canowindra ...	Yandilla King, 40 acres; Waratah, 10 acres.	Fallowed 4 inches August, harrowed January, springtoothed February	First week May.	70	60	Old land.	7·45	28	18	28	18	9½	27½	129
L. B. Boxsell, "Cherry Grove," Wallendbeen.	Cootamundra...	Marshall's No. 3	Fallowed 4 inches June, springtoothed full depth October, cross springtoothed November, springtoothed February and April Crop harrowed end August	25th April.	60	60	Very old land.	...	32	19½	23	19	9	26	128½
W. J. Bradford, "Pine Park," Eulimore.	Eugowra ...	Waratah	Fallowed 4½ inches September, October, disced November, springtoothed January, harrowed February, springtoothed March.	15th to 20th May	60	60	3	...	29	18	27	18	9	25½ (27)	126
D. W. Edis, "Prestonville," Ariah Park.	Ariah Park ...	Waratah ..	Fallowed 4½ inches June, July, harrowed July, springtoothed August, scarified October, scarified end December, again in February, and before sowing.	20th to 24th May	80	100	3	...	27	19	28	18	9	23½ (27)	124½
Gemmell Bros, "Glenhope," Beckom.	Ardlethan ...	Federation .	Fallowed 4 inches August, harrowed October, springtoothed January, crop harrowed July.	2nd April	45	85	15	9·17	24	18	27	19	9	27	124
F. G. Bryce, "Rosebank," Moombooldool.	Barellan ...	Turvey ..	Fallowed 3½ inches June, harrowed August, springtoothed September, November, and January, harrowed end March.	Early May.	60	90	Very old land.	7·75	28	17	26	18	9	25	123
R. I. Clark, "Armidale," Burrowa.	Burrowa ...	Marshall's No. 3.	Fallowed 4 inches to 5 inches September, springtoothed end February and early March. Crop fed-off lightly early August.	Second week April.	69	40	Old land.	10 50	27	19	26	17	9	25	123
H. S. Marshman, "Pinehurst," West Wyalong.	West Wyalong	Turvey, 30 acres; Waratah, 20 acres.	Fallowed 4 inches July, harrowed twice September, scarified twice October, springtoothed three times January and February broadpoints.	4th and 5th May.	Turvey, 70; Waratah, 90.	90	Old land.	7 93	25	17	26	17	8	26	119
J. Mahon, Morangarell P.O., Quandialla.	Quandilla ...	Yandilla King..	Fallowed 4 inches July, harrowed August, springtoothed November and in March.	Last week March.	60	60	2	5·41	16	19	28	15	10	23 (26)	111

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum if below 30.

falls cultivation can proceed within a day or two; moreover, crops in this locality are inclined to produce larger quantities of straw, and late sowing is therefore advisable.

While under these and similar circumstances sowing in June may be a good practice, still, it cannot be generally recommended, for June is the month of greatest rainfall and about the lowest rate of evaporation, and as the majority of the wheat soils in these districts will not carry a team for about a week after heavy rains, there is a grave risk of a similar experience to that of the 1925 season, when large areas of fallow remained unsown, or were sown under very unsatisfactory soil conditions.

The rate of seeding has a tendency to increase each year, the average quantity of seed sown per acre being 68 lb., as compared with an average of 65 lb. in the previous year's competitions. As regards the quantity of superphosphate employed, a greater increase is shown, the average applications being 78 lb. per acre as compared with 68 lb. per acre. The amount used per acre varied from 40 lb. to 112 lb., and, as in the case of the Riverina competition, the largest quantity was applied to the championship crop. With a June sowing increased quantities of seed and superphosphate are necessary corollaries.

Diseases.—It is significant that the whole of the competitors in this competition adopted the dry copper carbonate method for treating the seed wheat for the prevention of bunt, and that the whole of the crops were free from bunt except one, as regards which it was explained that trouble was experienced with the treating machine, and some of the seed was not treated. It is essential for complete protection from this disease that the whole of the grain should be thoroughly coated with the powder. Since the copper carbonate treatment has come into general practice bunt has considerably decreased, and complete control can be confidently anticipated in the near future.

This season the crops in the eastern portion of this division were not badly infected with flag smut, but this fungous disease had made serious inroads into the yields of some of the crops in the drier areas. As each year flag smut is taking a large toll of the wheat crop, it behoves growers to give special attention to the adoption of measures for its control, the most important of which is the introduction of an oat crop. Where the production of fat lambs is combined with wheat growing, the cultivation of fodder crops to be grazed by the sheep should take a prominent place, and oats, especially of the Mulga variety, is the most valuable crop available. The utilisation of a portion of the oat crop in the rotation as a fodder crop for sheep, and the ploughing in of the plant residues and sheep droppings before the crop runs to seed, has manifold advantages. It increases the carrying capacity of the holding, ensures the early marketing of lambs in prime condition, aids in the control of fungous diseases, such as flag smut, take-all, and foot-rot, assists in cleansing the land of black oats, and restores humus to the soil,

and thus helps to maintain its fertility, its texture, and its water-holding capacity. When it is intended to harvest the oat crop for grain or hay, care is necessary to use seed which is free from black oats, for it is not possible to grade out the black oats, and the land will soon become infested unless clean seed is sown.

Conclusion.

Taking the State as a whole, this year's competitions are without doubt the most interesting in the history of the movement. Despite the season's adversities the number of competitions conducted throughout the State is a record, reaching a total of sixty (including the championship competitions and several district efforts which were not eligible for the championships) Realising the great educational value of these competitions, the Department of Agriculture has extended its whole-hearted co-operation, and has arranged for the judging of the whole of these competitions (excepting one) by its field officers. The heavy yields of most of the competition crops and the generally satisfactory harvest now assured, in spite of a most unfavourable season. indicates clearly the great improvement in wheat-growing methods during recent years. This notable advance can be attributed in no small measure to the very helpful information derived from the crop competitions, for the encouragement of which much credit is due to the efforts of the Royal Agricultural Society.

MIDDLE WEST WHEAT AREA.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

There were thirteen entries for the Royal Agricultural Society's Cup, offered for the champion wheat crop of 50 acres in this area. Unfortunately, Wellington withdrew from the championship, as the premier crop there had been stripped before the judging commenced. Thirteen local societies conducted 50-acre crop competitions, which constitutes a record for this area. In such an adverse season it is striking evidence of the popularity of these competitions, and also affords proof that the middle western farmers have advanced some way towards the solution of the problem of producing payable wheat crops in exceptionally dry years.

The Season.

The season has been exceptionally dry—in fact, in September there was every indication of a complete crop failure over a large portion of the New South Wales wheat belt. The rainfall for April and May was very low, and June (a month that is usually depended upon to bring forth some good falls) was almost as dry throughout the central west. Peak Hill, where 104 points fell, was the only centre to receive a moderate fall. The month of July afforded no relief, being very dry at every centre, and at Trundle only 10

points were recorded for the month. August and the early part of September proved very dry periods, and it was not until the end of September and early October that good rains were received. These undoubtedly saved the situation, and had they not fallen very little wheat would have been produced in the middle western district.

On account of the unfavourable distribution of the rainfall a good deal of second growth occurred in many of the crops. The presence of green heads containing grain in a crop is most objectionable, as it is generally inadvisable to delay harvesting until the green heads ripen. Consequently the harvested sample shows a quantity of green grain, and in exceptional instances heating may occur.

RAINFALL for the Growing Period (Points).

Competitor.	Society.	May.	June.	July.	August	Sept.	Oct	Total
E. J. Johnson ..	Parkes	40	78	35	70	170	110	503
Mailer Bros.	Trundle ...	50	71	10	99	247	80	557
A. Simpson	Bogan Gate .	37	92	50	33	184	29	425
J. Rawsthorne ..	Forbes ...	58	107	59	108	219	92	643
R. Jelbart	Peak Hill ...	70	140	52	72	304	52	690
A. Wright	Dubbo ...	..	99	61	56	299	54	569
W. Johnstone ...	Cumnock ..	60	78	85	66	301	87	677

The prize-winners were:—

J. Rawsthorne, "Tomanbil," Forbes 1
E. J. Johnson, "Iona," Gunningbland (Parkes Society) .. 2
Cole Bros. and Hyland, "Wilga," Molong 3

The Winning Crops.

Mr. James Rawsthorne's crop of Waratah gained first place. It was a very fine crop considering the adverse season, and was estimated to yield 31 bushels per acre. The land was a medium to heavy chocolate loam, originally carrying box and pine timber. It was mouldboard-ploughed to a depth of 4 inches in August, then springtooth cultivated to the full ploughing depth in November, springtoothed again shallow ($2\frac{1}{2}$ inches deep) in February; sheep were grazed on the fallow, and it was sown at the end of April with a combine. Graded seed (treated with dry copper carbonate to prevent bunt) was sown at the rate of 60 lb. per acre, and 50 lb. of superphosphate applied. The crop was true to type, and showed very little disease.

Mr. E. J. Johnson, of Parkes, gained second place with a fine crop of Federation. The soil was a heavy self-muching chocolate loam (rendered somewhat uneven by extra friable banks), but a very fertile soil. The original timber was myall, box, and pine. The fallow was ploughed in August to a depth of $3\frac{1}{2}$ inches with a disc plough; it was then harrowed in

September, springtoothed in October to the full ploughing depth, then scarified in December, again in January, twice in February, twice in March, and finally sown with a combine on 2nd May. The frequent harrowing given this fallow was of great advantage on this particular class of soil, which being self-mulching could withstand and even benefit by such treatment. It is a practice which can be strongly recommended on these self-mulching soils; in fact, the finer the surface is rendered by frequent harrowings the better the resultant crop. It should, however, be remembered that this recommendation applies only to those self-mulching soils. On all medium to heavy loams which are not self-mulching it is desirable to maintain a cloddy surface, and the frequent use of the harrows is therefore not recommended; in fact, they should be used most sparingly. Mr. Johnson sowed 60 lb. of graded seed (treated with dry copper carbonate) and 70 lb. superphosphate. The crop was pure and true to type, and it was very clean and fairly free from disease, only showing a little flag smut.

Messrs. Cole Bros. and Hyland gained third place with a very clean crop of Turvey. It was grown on medium brown loam, originally timbered with yellow and white box. The land had been ploughed in June, 1925, but it was not sown in 1926 on account of being too wet. It was disced 3 inches in October, 1926, springtoothed in November, harrowed in January, and sown with a combine on 3rd May. It thus received the benefit of a two years' fallow, which was, of course, of great advantage in such a dry season as the past, but it is not a practice that could be advocated for obvious reasons.

Cultivation Methods.

The fact that such satisfactory crops were produced in a season so unfavourable reflects great credit on the competitors. The fallows in every case were well worked. It must be remembered that the fallowing period was rather dry in the west, and consequently the fallows could not be worked a great number of times. It is not advisable to work a fallow while dry, because no good purpose is served. Full use was made of sheep for grazing the fallow in every case, and the cultivator was used only after a satisfactory fall of rain.

Many of the western fallows were not ploughed as early as desirable; this was to some extent due to the wet weather at the fallowing time in 1926. Whenever possible, however, fallows in the west should be ploughed in June or July to ensure good results; it may even be advisable to long-summer-fallow portion of the land, *i.e.*, burn the stubble soon after harvest and cultivate about 2 or 3 inches deep in February or March, then plough in the winter.

Rates of Seeding, &c.

The rate of seeding varied from 46 lb. at Tullamore and Bogan Gate to 70 lb. at Molong. The amount of superphosphate varied from 36 lb. at Tullamore to 80 lb. at Gilgandra. No fertiliser was used on the crop at

Coonabarabran nor on that at Peak Hill. The tendency now is to increase the amount of seed, and also of superphosphate, provided the fallow is well prepared. Heavy applications of seed and superphosphate enable a well-prepared fallow to yield its maximum, but it will not make up for defects in the fallow. Superphosphate has the effect of enabling the crops to withstand the drought, making them deeper rooting and consequently more drought-resistant. While some few soils are found in the west which do not respond to the use of this fertiliser, it can be taken as a general rule that the application of from 56 to 60 lb. of superphosphate to well-worked fallow is highly profitable.

From 60 to 80 lb. of seed, according to the maturity of the variety and the time of sowing, can be recommended. Only in very rare instances should less than 60 lb. of seed be sown. Graded seed was used by all competitors, and the great majority of them used the dry copper carbonate treatment for preventing bunt with very satisfactory results, especially as regards better germination.

Diseases.

Most of the crops inspected were noticeably free from disease, considering the adverse season. Some loose smut was noted in most of the crops, but foot-rot and take-all were almost entirely absent. Flag smut was noticed in many of the crops, but not to the same extent as usual. The crops at Cumnock, Dubbo, and Coonbarabran were exceptionally free from disease—in fact, they were some of the healthiest crops I have ever seen.

Impressions.

The western district embraces a wide area of mixed farming country, and the soils and conditions vary greatly in each locality. It was very noticeable that in those districts where wheat-growing is the main consideration the standard of farming is much higher than in those where grazing is the main consideration, and only a small portion of the district is given over to wheat production. Such a state of affairs is, of course, to be expected in view of the fact that each particular locality presents its own local problems, which must be solved or partly solved before wheat-growing reaches a high standard there. In most centres there are many problems still awaiting solution, and these crop competitions afford one of the best means of gaining information and constructively stimulating the local growers to put forth their best efforts. This is particularly true of such a district as Coonabarabran. There wheat-growing has not received the attention that the district's fertile soils warrant. Large areas of excellent wheat land are to be seen in the district, but there are many cultural problems to be solved before the locality develops into a great wheat centre. The local agricultural society is to be congratulated on its efforts at crop improvement by means of crop competitions. The society offers the very liberal prize money of £20 first and £5 second. This is a good example of a practical effort to help the farmers to help themselves.

DETAILS of Awards—Middle-west Area.

Name and Address of Competitor.	Local Society.	Variety.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period April to October.	Points Awarded. Apparent yield (one point for every bushel.)	Trueness to type, Max. 20 points.	Freedom from Disease, Max. 30 points.	Evenness, Max. 20 points.	Condition, Max. 10 points.	*Cleanliness, Max. 30 points.	Total Points.
				lb.	lb.		ins.							
J. Rawsthorne, "Tomanbil," Forbes ...	Forbes	Waratah ...	Mid-April.	60	50	11	687	31	18	28	18	8½	28	131½
E. J. Johnson, "Iona," Gunningbland ...	Parkes	Federation ...	2 May	60	70	8	503	31	18½	27	17	8	28	129½
Cole Bros. and Hyland, "Wilga," Molong	Molong	Turvey	3 ,,	70	56	Old land	...	29	17	26	17	8	28	125
A. G. Simpson, "Baltimore," Bogan Gate	Bogan Gate ..	,, ...	8 ,,	48	48	7	396	25½	17½	28	18	9	26	124
W. H. Johnstone, The Gap, Cumnock ...	Cumnock ...	Currawa ...	23 April	60	60	Old land	677	26½	16	29	17	9	26	123½
A. S. Wright, "Springwood," Dubbo ...	Dubbo	Waratah ..	15 May	52	Nil.	5	569	28	18	29	15	7	23	120
Mr. M. B. Redden, "Merrybah," Purlewaugh.	Coonabarabran ..	Marshall's No. 3	1 ,,	55	60	Old land	...	23½	14	28½	17	8	(29) 27	118
Mailer Bros., "Trundle Park," Trundle ...	Trundle	Canberra ..	5 ,,	60	80	,,	557	24	18	26	16	7	26½	117½
Anderson Bros., "Booranda," Gilgandra	Gilgandra ...	Turvey	17 April	56	Nil.	,,	...	21	17	27	17	8	27	117
R. J. Jelbart, "Penryn," Trewilga ...	Peak Hill ...	Waratah and Federation.	5 May	50	56	4	690	24	16	27	16	7	24	114
A. Clifton, "Rosewood," Tullamore ...	Tullamore .	Federation ..	15 April	46	36	Old land	...	23	18	26	16½	6	(28) 22	111½
A. B. Mason, "Hartwood," Narromine ...	Narromine ...	Minister ...	15 May	50	50	,,	..	17	15	26	16	6	27	107

* First crop, 24 points; second 25; third, 26; fourth, 27; fifth, 28, sixth, 29; over six crops, 30 points. In parentheses is shown the maximum if below 30.

NORTH-WESTERN WHEAT AREA.

G. C. SPARKS, H.D.A., Manager, Glen Innes Experiment Farm.

Five only of the north-western agricultural bodies were represented in the championship competition of 1927, viz., Inverell, Moree, Boggabri, Gunnedah, and Tamworth—the smallest field for many years. As was the case in 1926 no district competitions were held at Manilla and Quirindi, while Narrabri was obliged to forego its competition for 1927 owing to adverse seasonal conditions.

Judging commenced at Moree on 31st October, and was concluded at Inverell on 9th November, the result being as follows:—

Waddell Bros., "Glenowrie," Oakwood, Inverell, 130 points .. 1
J. Cavanagh, "Roanoke," Curlewis, Gunnedah, 128½ points .. 2
J. H. McDonald and Sons, "Bonnie Doon," Tuncooey, Ashley, 127 points 3

The Winning Crops.

The Inverell crop (Waratah) was grown on a black loam overlying a light clay subsoil which had been cropped to wheat, maize, and oats for upwards of seventeen years. The land was ploughed in preparation for the crop under review in January, 1927, scarified in March, and again in May, and sown by "combine" in July with 60 lb. of graded seed, unmanured. A heavy germination of black oats which followed the June rains was destroyed by the seeding cultivation, and the wheat crop made an excellent start. The apparent yield of this crop was 32 bushels, and it was one of the best as regards type and purity that I have seen in the north-west. It was also very even and standing well, and as for disease, traces only were observed of flag smut, loose smut, leaf rust, and foot rot. Points were lost, however, on cleanliness, due to the presence of black oats, thistles, and other weeds. Messrs. Waddell Bros. were winners of the Inverell district competition of 1926, and are to be heartily congratulated upon having gained championship honors.

The Gunnedah crop was on a gravelly red and chocolate loam with a dark red, stiff clay subsoil, originally timbered with white box, kurrajong, and yarran, and the land has produced eleven crops of wheat in fourteen years. This crop was on long fallow, the land being ploughed in June and July, 1926, harrowed (twice) in September, and disced in December of that year, springtoothed in January and April, 1927, and sown by combine in mid-May with 40 lb. of graded seed, unmanured. Sheep were on the fallow throughout the period. The crop gave an apparent yield of 28 bushels, but lost points for purity due to the presence of odd "strangers." It showed a trace of both flag smut and loose smut, and was a little lodged in patches Points were also lost in cleanliness, black oat and wild mustard being present.

The Moree crop was on a self-mulching dark to chocolate loam with a stiff red clay subsoil, originally timbered with white box, belar, and wilga, and cropped to wheat eleven times in twelve years. The land was long fallowed, but this was partly ineffective owing to the failure of the winter

rains ... ary, 1927, springtooth ... in March and April, and sown by combine on 14th May. The fallow was heavily stocked with sheep to produce compaction. Seeding was at the rate of 48 lb. per acre, unmanured. The crop gave an apparent yield of 24 bushels; it was dense but slightly tipped, odd patches were thin and short due to lack of compaction. This crop was weed-free except for a slight trace of black oats, and it gained the highest points of the competing crops in this section, and also for freedom from disease, the only fault in the latter regard being a slight trace of foot rot. Type was quite good, but points were lost on purity owing to the presence of a few strangers.

Type and Purity.

Four of the five competing crops were from graded seed, and were very satisfactory as regards type and purity, but that at Tamworth was singularly lacking in these regards, being considerably off-type, and, at the same time, the most impure crop that it has ever been my duty to judge. The Tamworth crop was the only crop from ungraded seed; it had been purchased from a flour milling company six years earlier.

Trueness to type and purity are two of the most important considerations in championship crops, the seed of which it is almost certain will be widely distributed amongst other growers, and following the great improvement shown by north-western crops during the past four years, the Tamworth crop is a disappointment, and, at the same time, a menace. I would very strongly urge the advisability of framing a rule empowering judges to reject a crop that cannot gain a minimum of 17 marks (85 per cent.) for type and purity. The very fact of a district crop being judged for the championship is enough to place a "hall mark" upon it, and an action so drastic as my suggestion would act against an unduly great distribution of seed from an undesirable source.

Disease.

As was to have been anticipated, the crops were bunt free, the diseases present being flag smut, loose smut, foot rot, and leaf rust. Flag smut (although in no case was the infection serious) was considerably more in evidence than upon previous occasions, and while this increase is probably partly due to the dry summer weather, it is evident that some little concern is justified. Flag smut can be controlled by stubble burning, fallow, crop rotation, and the use of oaten hay along with the more resistant varieties of wheat, and although it still appears unlikely that this disease will become rampant in the north-west, the attention of farmers might be directed to the advisability of making an immediate effort at control. Loose smut was present in three of the crops, and in one case in an appreciable amount. Fortunately, however, this crop was not destined for seed purposes—the most approved measure for control of this disease is the use of seed from clean crops. Foot rot was less in evidence than in 1926, and leaf rust was shown by one crop only. Foot rot will yield to approved cultural methods, and rust can be guarded against fairly successfully by seasonable sowing of resistant wheat varieties.

A feature of [illegible] of Waratah, three of the five crops judged [illegible] variety. It is interesting to note also that all three of the varieties figuring in the north-west crops are amongst those recommended by the Department of Agriculture for that territory. It has been noted upon previous occasions that the north-western farmers are up to the moment as regards the selection of their standard varieties, and it is felt that suggestions for improvement in this direction are uncalled for.

The Rainfall.

Drought conditions prevailed over the north-west wheat belt during the season under review. The attached rainfall table will indicate that the May to October rainfall was extremely low, ranging from 139 points at Moree to 398 at Loomberah, but in spite of this, excellent crops were grown by individual farmers. The most remarkable instances of this fact are the Inverell crop—sown in July and receiving a total rainfall during the growing period of 167 points, upon which a yield of upwards of 10½ bags was gained—and the Moree crop—sown in May and producing eight bags upon a rainfall during the growing period of 139 points. There can be no question that these results constitute one of the most brilliant successes achieved in the history of Australian dry farming, and when the method which made these results possible becomes general amongst the farmers of the north-west, it will mean that in seasons of severest drought wheat production will be maintained with all its resultant prosperity, and this in a district hitherto regarded in some quarters as unsuited to the growth of wheat.

RAINFALL.

	Inverell.	Curlewis.	Ashley.	Boggabri.	Loomberah.
1926.	Points.	Points.	Points.	Points.	Points.
July	......	140	......	110	......
August	......	10	......	44	......
September ...	......	228	......	254	......
October	......	10	......	20	......
November ...	......	No record.	......	6	......
December ...	......	"	......	514	......
1927.					
January	445	10	710	270	......
February ...	25	......	160	......	......
March	433	......	100	114	126
April	20	216	210	170	264
May	16	......	......	4	......
June	149	117	70	98	107
July	23	......	......	40	72
August	5	60	60	42	61
September ...	19	......	9	56	40
October	120	......	......	100	108

I have no hesitation in reiterating the statement made in my report to you on the 1926 championship, that the north-west offers extraordinary—even unique—possibilities in wheat culture.

DETAILS of Awards—North-west Area.

Name and Address of Competitor.	Local Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period, April to October.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. Maximum, 30 points.	Freedom from Disease. Maximum, 30 points.	Evenness. Maximum, 20 points.	Condition. Maximum, 10 points.	*Cleanliness. Max., 30 points.	Total Points.
					lb.	lb.		ins.							
Waddell Bros., "Glengowrie," Oakwood.	Inverell ...	Waratah ...	Ploughed January, 1927, scarified March-May, sown by "Combine."	July ...	60	Nil.	Crop, 17 yrs.	3·52	32	19	26	19	9	25	130
J. Cavanagh, "Roanoke," Curlewis.	Gunnedah ...	Clarendon ...	Ploughed June, July, 1926, harrowed (twice) September, disced December, springtoothed January-April, 1927, sown by "Combine."	Mid-May	40	Nil.	10	3·93	28	18	28	19	9½	26	128½
J. H. McDonald and Sons, "Bonnie Doon," Tuncooey, Ashley.	Moree	Waratah ...	Ploughed August, 1926, harrowed January, 1927, springtoothed February, March, April, sown by "Combine."	Mid-May	48	Nil.	11	3·49	24	18½	29	18½	8	29	127
J. B. White and Sons, "Braymont," Boggabri.	Boggabri ...	Waratah ...	Ploughed July, 1926, harrowed July, scarified and harrowed (twice) August, harrowed September (twice) December, January, sown by "Combine."	Mid-May	60	Nil.	2	5·10	22	18	28	17	9	24 (26)	118
J. Whitbread, "Pendene," Loomberah.	Tamworth ...	Currawa ...	Stubble worked by "Combine" February, March, April, 1927, sown by "Combine."	End April	58/60	Nil.	1	6·52	27½	10	28	18½	9	24 (25)	117

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum if below 30.

RIVERINA WHEAT AREA.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

This year twelve district societies in this division organised competitions, the winners of which were eligible to compete for championship honours. This number is equal to the best in any previous year, and the fact that there was no reduction in the number of entrants in a season which may be regarded as very adverse is a fine tribute to the high standard of the farming methods adopted throughout the Riverina division.

The societies which submitted entries for the championship were: Albury, Berrigan, Coolamon, Corowa, Culcairn, Finley, Henty, Lockhart, Murrumbidgee (Wagga), Narrandera, Oaklands (Farmers and Settlers' Association), and The Rock (F. and S. Association). Judging was commenced on 28th November, and was completed on 3rd December.

The Season.

Speaking generally, the season was very unfavourable, the rainfalls during the fallow period as well as during the growing period being much below average. Drought conditions ruled when the sowing period arrived, and it was necessary to commence sowing on dry seed-beds, but the dry spell was broken at a critical priod in May and followed by intermittent rains, and a satisfactory germination resulted. As serviceable rains failed to materialise throughout the winter and early spring months, and the adverse conditions were accentuated by a succession of heavy frosts, harvest prospects towards the end of September were far from being bright. The situation, however, was saved by bountiful rains at an opportune time at the beginning of October, as a result of which the crops were not only saved from anticipated failure, but they made such remarkable recovery that the crops in the later districts are quite equal to those produced in a very favourable season. Further rains during the month brought the October registration well above average, and ensured a satisfactory development of the grain. The border districts of Albury and Corowa benefited by good rains in May and August, in which the rest of the division did not participate.

The prize-winners were:—

W. D. Heffernan, "Ballangarrah," Junee (Wagga Society) .. 1
A. C. Severin, "Glenburnie," Brocklesby (Albury Society) .. 2
F. W. Knight and Sons, "Bolinda Glen," Corowa (Corowa Society) 3

The Leading Crops.

The points awarded each competitor and cultural details of each crop entered are presented in tabulated form for ready comparison. The championship crop was produced on a granitic grey loam which had previously

been timbered with box. It was a dense well-headed crop of Yandilla King, which was practically free from disease, of satisfactory purity and standing up well; the only defect was the presence of a few saffron thistles. The seed had been treated with formalin, and the chief factors which contributed to the success were the satisfactory preparation of the soil and the judgment in sowing. Generous quantities of both seed and superphosphate were sown at the end of April, which is an ideal period for the sowing of this variety.

The second prize crop consisted of a block of Federation which was estimated to return the highest yield in the competition, namely, 39 bushels. It was a fairly dense crop carrying a very well-developed head, and was produced on a red loam soil which had been cropped for very many years. Fungous diseases were not as prevalent as is usual with this variety, probably due to the fact that oats had been the previous crop. Success in winning championship distinction was marred by a variation of type and a sprinkling of black oats.

The crop gaining third place in the competition was of the Bomen variety, and scored well under all headings. Its freedom from flag smut supported the reputation of this variety for flag-smut resistance. In view of the fact that the land had been under cultivation for about forty-six years, the absence of weed growth was a credit to Mr. Knight and his sons.

Lessons from the Competition.

Fallowing.—The production of yields up to 39 bushels per acre, and an average yield of 31 bushels for all crops competing, was only made possible by fallowing; in fact, it is the general adoption of this method throughout the division that enabled the crops to hold out so well throughout the droughty period, and to take advantage of the rains in October and return a satisfactory harvest. This result should emphasise that fallowing is the wheat-growers' greatest insurance against drought.

In consequence of the dry summer, a minimum of cultivation of the fallows sufficed, and provided the fallows were ploughed sufficiently early, cultivated deeply early in spring, and given a shallow cultivation prior to sowing, good yields resulted. No hard and fast rules can be laid down as to how often the fallows should be worked, for the number of cultivations should almost entirely be governed by the rainfall and the nature of the soil, and there is nothing to be gained in cultivating a fallow unless for the definite object of creating a mulch, destroying weed growth, or preparing the seed bed. What is of more importance is that the cultivations should be performed at the correct time; after every heavy rain on the fallow no time should be lost in proceeding with the cultivation to renew the mulch that has been destroyed by the rain, and thus "put in the stopper," as it were, by preventing evaporation of soil moisture.

Any delay in restoring the mulch after heavy rains is at the expense of soil moisture, and it is for this purpose that tractors are of great service, in that cultivations can be completed in the minimum period. These

DETAILS of Awards—Riverina Area.

Name and Address of Competitor.	Local Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Rainfall during effective period, April to October.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. Maximum, 30 points.	Freedom from Disease. Maximum, 30 points.	Evenness. Maximum, 20 points.	Condition. Maximum, 10 points	*Cleanliness. Max., 30 points.	Total Points.
					lb.	lb.	lb.	ins.							
W. D. Heffernan, "Ballangarrah," Junee.	Wagga Wagga..	Yandilla King	Fallowed 4½ inches deep in August, harrowed October, springtoothed with wide points November and in March.	End April	76	120	10	...	37	19	29	19	9	28	141
A. C. Severin and Sons, "Glenburnie," Brocklesby.	Albury ...	Federation ...	Fallowed—4 inches July, scarified October and in February.	Early May.	70 to 75.	90	Very old land.	...	39	17	28	19	9	28	140
F. W. Knight and Sons, "Bolinda Glen," Corowa.	Corowa ...	Bomen ...	Fallowed 5½ inches August, harrowed and springtoothed October, springtoothed May and cross-drilled.	Last week May.	75	84	"	10·80	34	19	29	19	8½	29	138½
D. A. B. Gibbs, "Oak Hill," Morven.	Culcairn ...	Federation ...	Fallowed 3 inches to 5 inches September, harrowed November, springtoothed January, scarified May.	18th to 25th May.	75	112	Old land.	...	36	18	24	19	9	29	135
W. J. Scott, "Elgin," Munyabla.	Henty ...	Waratah ...	Fallowed 4 inches July, springtoothed October, harrowed February, harrowed two weeks after sowing.	Last week May.	80	90	Very old. land.	...	32	18	28	19	8	29	134
W. J. McGrath, "Avon," The Rock.	The Rock ...	Waratah ...	Fallowed 4½ inches August, September, harrowed twice early October, portion disced November, balance disced February, springtoothed twice in May.	End May	65	90	Old land.	9·36	31	18½	28	19	8½	27½	132½

R. and A. Gooden, Glen Oak, via Wagga Wagga.	Narrandera ...	Bomen ...	Fallowed 4½ inches July, August, harrowed after ploughing, springtoothed early November and in April.	End April	60	56	Old land.	...	28	19	28	19	9	28	131
D. Munro, "The Gums," Daysdale.	Oaklands ...	Federation ...	Fallowed 4 inches July, harrowed August and September, springtoothed October, disced February, harrowed March, harrowed after sowing.	End May	90	110	10	...	29	17	27	19	9½	29	130½
H. B. Webb, "Woodstock," Berrigan.	Berrigan ...	Nabawa ...	Fallowed 3½ inches to 4 inches June, harrowed July, springtoothed July, August, harrowed August, portion disced and springtoothed August, and portion spike-rolled August.	First week May.	70	70	Old land.	6 77	29	17	29	18	9	27	129
A. H. Gollasch, "Belmont," Milbrulong.	Lockhart ..	Turvey ...	Fallowed 3½ inches to 4 inches August, scarified September, disced November, scarified March.	Second week May.	60	90	Very old land.	...	31	17½	27	17	9	25	126½
W. Lawrence, "Redbank," Coolamon.	Coolamon ..	Waratah, 40 acres; Yandilla King, 10 acres.	Fallowed 4 inches June, harrowed August, scarified September, scarified January and before sowing, crop rolled July and also in August, crop harrowed August.	Early May.	90	90	"	..	26	18	27½	19	8½	27	126
A. W. Tullock, "Prairie Farm," Finley.	Finley ...	Federation, 25 acres: Bomen, 25 acres.	Fallowed 4 inches July, harrowed, springtoothed September, harrowed September and January, springtoothed May.	First week May.	60	90	"	7·35	20	17	26	19	9	25	116

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

remarks apply more particularly to cultivations of the fallow in the early spring, which is the period of the greatest loss of soil moisture unless evaporation is checked by the provision of a loose dry soil mulch. In mid-summer the rate of evaporation is so great in most wheat districts that the surface soil is dried out more rapidly than the soil moisture can rise by capillarity, and the further evaporation of moisture from the lower soil layers is thus checked. Cultivations in the summer, however, are of value in controlling weed growth, and in preventing run-off of subsequent rains.

Varieties.—The variety which secured the largest representation in the championship by virtue of being the winning crop in the district competitions was Federation. Furthermore, it was a crop of this variety which secured the second prize with the highest estimated yield, and also filled fourth place in the competition. It is thus the most successful variety, and although it has not been very prominent in previous competitions, has proved that it still retains its capacity as a bag-filler under dry conditions. It is most suited to the southern districts of the State, and is also a useful variety in other wheat districts on account of its storm resistance. Yandilla King, by gaining the championship, has proved its worth; it is a variety that will never fail to return good yields if sown sufficiently early on well-prepared fallow. It is fairly resistant to disease, and stands up well for a tall variety. The grain is held tightly—a characteristic that was of great advantage last year when great loss was sustained by the shedding of other varieties as the result of wind storms.

Bomen has figured prominently in this and previous competitions in the Riverina, where it has proved a good yielder with a strong straw and resistant to disease. Unfortunately it possesses red grain, and on this account is not recommended.

Waratah has not been so successful as in the preceding year's competition, due chiefly to the fact that most crops of this and other early maturing varieties this season had a short ear, by reason of the failure of the lowest spikelets to develop. This was doubtless due to the early maturing varieties coming into the shot-blade when conditions were dry and frosty. Later maturing varieties also had an advantage in that they were not so far advanced when the drought broke, and therefore received more benefit from the October rains.

This was the first competition in which Nabawa wheat was represented. This variety is attracting much attention, chiefly by reason of its resistance to flag smut. No trace of the disease could be detected in the crop, and it should prove a useful variety for sowing land on which the preceding crop had been badly infected with flag smut. It is a mid-season to early maturer, and is very promising as a yielder; in Western Australia it is the variety most extensively grown.

Seeding Operations.—The time of sowing varied from the end of April to the end of May, which may be regarded as the optimum seeding period, due consideration being given to the district and the maturity of the variety. High rates of seeding have been adopted varying from 60 to 90 lb., with an

average of 73 lb. per acre. Some years ago the use of such large quantities of seed, especially in a dry year, was regarded as courting failure, the contention being that the extra drain on the soil moisture would be so great that there would be insufficient for the final development of the crop, but in recent years provision is made for the extra demand on soil moisture by the increased quantities of moisture conserved by approved fallowing methods. In a dry season crops do not stool as well as in favourable seasons, and even though the moisture supply may not be generous, still the demand is not excessive. However, there are several factors that should influence the rate of seeding, the chief of which are fertility of soil, variety, and time of sowing.

The most outstanding feature of the competition is the large quantities of superphosphate that have been applied to the competing crops, averaging 91 lb. of high-grade superphosphate per acre—an increase of 20 lb. on the average quantity applied to the crops in the previous competition in this division. The quantities varied from 56 lb. to 120 lb. per acre, and the largest quantity was used in the production of the winning crop. Some wheat-growers aver that large quantities of superphosphate will cause the wheat crop to burn off in a dry year. This contention has evidently arisen from the occasional scorching of the flag of crops to which large quantities of superphosphate have been applied in a season that is favourable in the early stages, but with a dry finish accompanied by hot winds, but even the so-called "burning-off" does not depreciate the yield, but only affects the flag due to the relatively greater luxuriance of the manured crop. On the contrary, heavy applications of superphosphate are a distinct advantage in a dry season such as the present one, by reason of the fact that it stimulates root development, thus enabling the crop to draw its moisture from the lower soil layers and increasing its foraging area for moisture.

Diseases.—Nine of the twelve competitors used the dry copper carbonate method of seed treatment for the prevention of bunt; one used bluestone solution, one formalin, and one neglected to treat the seed at all. Bunt was detected only in the crop the seed for which had received no treatment, demonstrating that it is very unsafe to risk sowing seed without treatment. It was this farmer's practice to treat the seed each second year, and as no bunt was noticed in the seed it was considered safe to sow, but as the bunt spores are microscopic it is impossible to determine by the naked eye whether the seed is free from infection. Flag smut was not as prevalent as in some previous years, although one crop of Federation was badly infected. Nabawa was quite free from infection, and Bomen and Yandilla King showed a degree of resistance.

Take-all was present in some crops, evidently due to working the soil when in a dry condition. Infection by take-all would be reduced to a minimum by avoiding cultivating the soil when dry, and by preparing firmly compacted seed beds.

Dipping of Lambs

E. A. ELLIOTT, Sheep and Wool Expert.

TOWARDS the end of 1926, a dipping test was carried out at Bathurst Experiment Farm to ascertain if the dipping of lambs would check the growth, or in any way tend to detract from their market value. The trial was repeated this season at Hawkesbury Agricultural College, and the results indicated that if care is taken in the dipping and in the preparation of the mixture no harm will result from dipping lambs which are to be marketed as suckers.

On 9th November, three crossbred lambs were dipped in an arsenical powder dip, three were dipped in a carbolic dip, and three were marked and left undipped as a check. The lambs were an average of ten weeks old when the trial commenced. Dipping was carried out in the shearing shed in a large cask, the lambs being held in for the time it would normally take to traverse a proper dip—about 45 seconds. No ill effects resulted from the dipping. No ticks or lice were present before the dipping or later.

The lambs were weighed before being dipped, five days after, and finally a fortnight later again. The following are the weights obtained :—

Dip used.	Weight before trial commenced (9th Nov.)	Weight 5 days later.	Weight 19 days after commencement.	Increases from first to third weighing.	
				Individual	Average.
	lb.	lb.	lb.	lb.	lb.
Carbolic liquid	45	45	59	14	11·3
	54	55	65	11	
	57	58	65	9	
Arsenical powder	59	60	66	7	10·3
	43	43	55	12	
	45	46	57	12	
Undipped Check	47	48	55	8	10
	43	44	55	12	
	60	61	70	10	

The increases in weight shows that no check was received by any one of the lambs.

An examination of the wool was made on 5th December. The wool of the dipped lambs was slightly brighter than the check lot, though the lot dipped in arsenical powder dip, when seen in the yard, had a slightly creamy tip. The skin of all the lambs was quite healthy.

Varieties of Wheat and Other Cereals.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE following are the latest departmental recommendations as to the varieties of wheat, oats, and barley best suited to various portions of the State:—

WHEAT.

Coastal Districts.

[Embracing districts which are specially subject to rust.]

For Hay—

Clarendon, Florence, Firbank, Gresley (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

Sowing for hay should be made later than for green fodder.

Northern Tableland.

[Of which Glen Innes is representative.]

For Grain or Hay—

Genoa (early sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

For Green Fodder—

Genoa (early sowing);
Florence (early, mid-season, and late sowing);
Clarendon (early, mid-season, and late sowing).

Central Tableland.

[Of which Bathurst is representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain only—

Federation (mid-season sowing);
Canberra (mid-season and late sowing).

Southern Tableland.

[Of which the Monaro, Crookwell, and Batlow districts are representative.]

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing).

South-western Slopes and Eastern Riverina.

[Of which Wagga and Temora are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Union (early and mid-season sowing);
Federation (early and mid-season sowing);
Canberra (late sowing).

For Hay only—

Zealand (early sowing).

South-western Plains and Western Riverina.

[Of which Deniliquin and Hillston are representative.]

For Grain or Hay—

Waratah (mid-season sowing);
Gresley (mid-season sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Canberra (mid-season and late sowing).

Central-western Slopes.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Coonabarabran;
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Bena (early and mid-season sowing);
Federation (early and mid-season sowing);
Hard Federation (mid-season sowing);
Canberra (late sowing).

North-western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing), especially suitable for the cooler portions of this district, such as Inverell and Delungra;
Currawa (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (early and mid-season sowing);
Clarendon (late sowing);
Florence (late sowing).

For Grain only—

Hard Federation (mid-season and late sowing);
Canberra (mid-season and late sowing);
Aussie (mid-season and late sowing).

North-western Plains.

[Of which Coonamble is representative.]

For Grain or Hay—

Canberra (mid-season and late sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

Western Plains.

[Of which Nyngan, Trangie, and Condobolin are representative.]

For Grain or Hay—

Hard Federation (early sowing);
Waratah (mid-season sowing);
Canberra (mid-season sowing);
Firbank (mid-season and late sowing).

Murrumbidgee Irrigation Areas.

For Hay on the Irrigation Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Turvey (early sowing);
Firbank (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain on Dry Areas—

Federation (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (mid-season and late sowing);
Canberra (mid-season and late sowing).

OATS.

The varieties of oats recommended for various districts are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga.
South Coast.—Algerian, Guyra, Sunrise, Mulga, Myall.
Central Tableland.—Algerian, Guyra, Lachlan, Mulga.
Northern Tableland.—Reid, White Tartarian, Algerian, Guyra.
Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Myall.
Monaro.—White Tartarian, Algerian, Mulga.
South-western Slopes and Riverina.—Algerian, Lachlan, Sunrise, Belar, Mulga.
Central-western Slopes.—Algerian, Lachlan, Guyra, Mulga.
North-western Slopes.—Algerian, Guyra, Sunrise, Mulga.
Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.
Western Plains.—Sunrise, Mulga, Buddah.

BARLEY.

The varieties recommended by the Department are:—

Two-row type (commonly called "malting barleys").—Pryor.
Six-row type (commonly called "feed barleys").—Skinless for green fodder for early winter green feed. Cape and Trabut for green fodder, and grain for stock in the cooler districts.

The following are brief notes on these varieties:—

Trabut.—A rather short, compact-eared barley of the Cape type, with attractive yellow grain. About the same season as Cape.

Cape.—A very largely grown six-row type variety, ripening early, and with long awns and grains of a bluish-green tint. Though usually regarded as a feed barley, bright samples are suitable for malting purposes.

Skinless.—Awnless, very early; grain very distinct in appearance, as the hull comes off in threshing.

Pryor.—This variety matures about the same time as Cape, and may be sown at the same time. It is a good variety for the wheat districts, as it may be harvested before wheat-stripping starts. It has a head like Kinver, but slightly shorter.

Seed Trials in the Laboratory and the Field.

"Good *versus* Bad Seed" has represented the title of many published papers and been the theme of centuries of discussion. What applies in seed trays and careful sowings may not, and often does not, apply to wet, cold, lumpy tilths. There appears to be a need for further study of the influence of the seed on the crop under farming conditions, and for a link between germination-capacity in a laboratory test and value in the field. While waiting for further knowledge, the old rule "do not economise on seed" is the safest guide.—F. L. Engledow in "Agricultural Research in 1926."

Field Experiments with Wheat.

FERTILISER TRIALS AT TRANGIE EXPERIMENT FARM, 1927.

J. A. WILLIAMSON, H.D.A., Assistant Experimentalist.

A TRIAL was inaugurated at this farm last year to determine whether superphosphate would be beneficial to the wheat crop in this district, and, if so, what rate of application would give the most payable results. The results being encouraging, the trial was continued this year.

The experiment was conducted on soil of a light-red, sandy loam nature, of drift formation, which had been long winter fallowed the previous season. The soil had been mouldboard ploughed early in May, fed off with sheep to control weeds, and cultivated with a springtooth cultivator whenever necessary to maintain a weed-free, well-worked, clean fallow.

The plots (arranged in triplicate) were sown on 20th April with Waratah wheat at the rate of 58 lb. per acre. The treatments of the various plots are shown in the table below. The seed bed at the time of sowing was in an ideal condition, being free from weeds and well charged with moisture as a result of four days of good rain just prior to sowing.

The germination in all cases was excellent, and no difference could be noted at the earliest stages between the various plots, but the hard winter, with severe frosts and continued dry conditions, soon caused very marked differences to be discernible. In early spring a gradual improvement in growth with each increased application of fertiliser was easily observed.

The wheat on the plots receiving no superphosphate or only light applications showed the effect of the frosts and dry conditions considerably, while the wheat on the plots treated with heavier applications continued to grow vigorously. The healthy, abundant dark-green flag on the latter plots presented an extreme comparison with the sparse, weak, spindly, yellow growth on the plots that received no fertiliser. Good rain towards the close of September resulted in considerable improvement of the plots; no doubt but for this rain the final results would have shown considerably greater variations. The heavier applications of fertiliser resulted in the crop maturing at least a week earlier than the crop on the untreated land.

Harvesting of all plots took place on 22nd November, a good sample of grain being obtained from all plots. The yields were as follows:—

Treatment.	Yield per acre.
	bus. lb.
No fertiliser	9 33
30 lb. superphosphate	13 30
50 lb. "	14 5
78 lb. "	17 15
109 lb. "	18 35

The rainfall during the fallowing period was 1,077 points, and the total rain during the growing period was 544 points, made up as follows:—

	Points.		Points.
May	22	September	180
June	56	October	107
July	5	November	60
August	114		

Taking the value of wheat as 5s. 6d. per bushel, and the cost of the superphosphate at 6s. 1d. per cwt., the increased profit from the use of superphosphate as compared with no fertiliser was as follows:—

30 lb. superphosphate, £1 0s. 1d. per acre.
50 lb. superphosphate, £1 2s. 2½d. per acre.
78 lb. superphosphate, £1 18s. 1d. per acre.
109 lb. superphosphate, £2 3s. 8½d. per acre.

The value of superphosphate this season was thus very marked, the application of 109 lb. superphosphate practically doubling the yield as compared with wheat grown with no fertiliser. The opinion often expressed by farmers that superphosphate will burn the crop in a dry year is here well disproved. Providing the soil has been well fallowed, enabling a good reserve of moisture to be created, no harmful effects will result from the use of superphosphate. On the other hand, by inducing a larger root system, the superphosphate enables the crop to enjoy a greater feeding area and to withstand dry conditions the better.

The results this year are very marked, but it must be remembered that this is only the second year of the trial at this centre, and before definite recommendations can be made the experiment will have to be conducted over a number of years. However, the results definitely indicate that superphosphate will ensure a payable yield in this district, despite adverse seasonal conditions, provided the land has been well fallowed.

Spotted Wilt in Tomatoes.

After the account of the Spotted Wilt disease in tomatoes, which appeared in the *Agricultural Gazette* last month (page 59), had gone to press, there came to hand a report of great interest containing details of the investigation of this disease conducted by Mr. H. A. Pittman at the Waite Agricultural Research Institute, Adelaide (*Jour. of Council for Scientific and Industrial Research,* vol. 1, pp. 74-77, Nov., 1927).

This investigator reports that inoculation experiments were conducted with jassids (*Empoasca* sp.), aphids, red spiders (*Tetranychus telarius,* Linn.), an undescribed species of mite, white fly (*Trialeurodes vaporariorum*) and *Thrips tabaci.* Infection resulted only when larval thrips were used, and it is suggested (*a*) that this insect only is capable of transmitting the disease, and (*b*) that it is likely that, under natural conditions, it is the winged adults which transmit the disease from plant to plant.—R. J. Noble, Biologist.

Field Experiments with Wheat.

VARIETY TRIALS AT COWRA EXPERIMENT FARM, 1927.

R. N. MEDLEY, H.D.A., Experimantalist.

WHEAT variety trials for hay and grain were again conducted during the past season with the object of determining the most suitable varieties to grow in this district, and also to test out any new and imported varieties against those already generally accepted as suitable to this particular locality. The trials were sown in triplicate in three sections, viz. :—(*a*) Early sown hay, (*b*) early sown grain, (*c*) late sown grain. Each plot was 1/25 acre in area.

The land on which the trials were planted had been previously cropped to wheat (experiments) in 1925; a crop of rape followed during the 1926 season after the wheat stubble had been grazed, burned, and disc-ploughed. The rape was ploughed under on 12th October, 1926, and the fallow then worked as follows:—Springtooth cultivated, 17th January, 1927; skim-ploughed, 24th January; rigid tyne cultivated, 3rd March; springtooth cultivated, 1st and 27th April; for the late-sown-grain section, a further stroke of the springtooth was given 18th May. The land was stocked periodically during the fallow period.

The rainfall during the fallow and growing periods was as follows:—

—	Early Sown Hay.	Early Sown Grain.	Late Sown Grain.
	Fallow Period.		
1926.	Points.	Points.	Points.
October (12th to 31st) ...	38	38	38
November	51	51	51
December	347	347	347
1927.			
January	380	380	380
February	5	5	5
March	152	152	152
April (1st to 27th) ...	88	88	88
May (1st to 20th) ...	......	......	82
Total Fallow Period	1,061	1,061	1,143
	Growing Period.		
1927.	Points.	Points.	Points.
April (27th to 30th) ...	......	......	......
May	98	98	16
June	76	76	76
July	78	78	78
August	109	109	109
September...	240	240	240
October	263	263	263
November	......	269	269
Total Growing Period	864	1,133	1,051

The Season.

The season was a remarkable one in that the early winter rainfall was very much below the average; this, however, did not detrimentally affect the germination of the crops, which throughout the three sections was very satisfactory and uniform. Heavy frosts in June had a tendency to check the growth, but because of light rain following, the effects of the frost were not as serious as they might otherwise have been. During late August and early September the crops began to show ill-effects of the unseasonable conditions; several varieties reached the ears-peeping stage during this period, and, as a consequence, when rain came at the latter end of September these varieties soon presented a very uneven appearance as a result of much second growth, which further resulted in an uneven ripening. The rain at the end of September resulted in a splendid recovery of the crops and average yields, at least, were assured. High winds a day or so before the harvesting of the grain trials caused many varieties to shatter.

Diseases.

Flag smut was the most prevalent disease this season, being found in varying proportions in many varieties. Bredbo was perhaps the variety most heavily infected, while Nabawa exhibited a complete resistance, being closely followed in this respect by Wandilla. Loose smut was also present in Union, Cookapoi, and, more especially, Canberra. Traces of rust were found late in the season, but not sufficient to cause any concern.

The Early Sown Hay Section.

These plots were sown on 28th April with 50 lb. graded seed and 60 lb. of high-grade superphosphate per acre, the seed having been treated with a bunt preventive prior to sowing. Exquisite was the most outstanding variety. Harvesting was carried out on 1st November, 1927.

YIELDS of Early Sown Hay Varieties.

Variety.	Average Yield of Triplicate Plots, 1927.			Average yield since 1921.		
	t.	c.	q.	t.	c.	q.
Exquisite	2	3	0	2	14	0 (2 years).
Yandilla King (check) ...	1	18	2	3	2	1 (4 years).
Waratah...	1	15	0	3	9	2 (5 years).
Ford	1	14	3	2	3	2 (2 years).
Canimbla	1	14	2	3	12	1 (6 years).
Wandilla	1	8	1	3	9	0 (7 years).

Early Sown Grain Variety Trial.

The plots were sown on 28th April at the rate of 50 lb. of graded seed and 60 lb. of high-grade superphosphate per acre. Union was included in this trial for the first time this year. Canimbla yielded best, followed by Exquisite and Duchess. Harvesting was carried out on 3rd December, 1927

YIELDS of Early Sown Grain Varieties.

Variety.	Average yield of Triplicate Plots, 1927		Average yield since 1922.		
	bus.	lb.	bus.	lb.	
Canimbla	33	16	37	58	(6 years).
Exquisite	31	49	32	26	(2 years).
Duchess	31	3	31	27	(2 years).
Onas	30	54	37	42	(6 years).
Yandilla King	30	38	28	28	(2 years).
Ford	30	17	33	15	(3 years).
Union	30	0	30	0	(1 year).
Cadia	29	49	35	49	(6 years).
Bena	28	16	39	12	(6 years).
Bredbo	28	12	32	16	(3 years).
Wandilla	25	0	37	18	(6 years).
Hard Federation (check) ...	25	2	32	44	(6 years).

Late Sown Grain Section.

Nabawa, Cookapoi, Bogan, and Plowman's 67 were included for the first time in these trials, which were sown on 20th May with 66 lb. of graded seed and 60 lb. of superphosphate per acre. Nabawa showed greatest promise, giving a good yield as well as being resistant to flag smut. Harvesting was carried out on 5th December, 1927.

YIELDS of Late Sown Grain Varieties.

Variety.	Average yield of Triplicate Plots, 1927.		Average yield since 1922.		
	bus.	lb.	bus.	lb.	
Bena	31	54	34	52	(6 years).
Duri	31	36	34	18	(5 years).
Waratah...	31	32	35	18	(6 years).
Bobin	30	38	32	38	(5 years).
Bald Early	30	38	30	8	(2 years).
Nabawa	30	29	30	29	(1 year).
Cookapoi	30	21	30	21	(1 year).
Plowman's 67	29	48	29	48	(1 year).
Boolaroo	29	27	24	53	(3 years).
Hard Federation (checks) ...	29	26	32	12	(6 years).
Bogan	28	24	28	24	(1 year).
Ford	27	9	24	28	(3 years).
Canberra	26	32	22	16	(2 years).
Boonoo	23	24	31	17	(5 years).

Notes on Varieties.

Hard Federation (Selection from Federation).—Used as check in the grain trials; has yielded well over a period of years. This year gave better results in the late sown section than in the early sown one; traces of flag smut were present.

Exquisite (Gluyas x Atlanta x Gluyas).—A good dual-purpose variety from South Australia suited to early sowing. It was the most outstanding variety in the hay trial and was prominent in the early grain trial. It is a tall-growing variety with semi-solid straw and light brown, drooping heads; holds the grain well.

Yandilla King (Yandilla x Silver King).—A good dual-purpose variety for early sowing, yielding well for hay and grain; holds the grain well.

Waratah (Hudson's Early Purple Straw x Gluyas Early).—The most popular variety at present under general cultivation; gave good yields in both the hay and grain sections, shattered slightly. As a late sown grain variety has given very good results in this locality for a number of years.

Canimbla (Hard Federation x Cleveland).—The outstanding variety in the early sown grain trial; also yielded well in the hay section. Matures a little later than Hard Federation; holds grain well. This is a very promising variety.

Wandilla (Federation x Yandilla King).—A variety showing a marked degree of resistance to flag smut. A consistent yielder of grain and hay; shorter in the straw than Yandilla King; the young growth has a rather distinctive bluish tinge about the foliage.

Ford (Fan x Comeback x Zealand Blue).—An importation from South Australia. A tall strawed variety—the tallest in the hay trial. The ears are slightly tapering, white and tip-awned; shatters slightly.

Duchess (Federation x Minister).—A tall strawed, brown, club-headed variety, holding the grain well. Yields well for grain, to which purpose it is well suited. A promising variety for early sowing.

Onas (Federation x Tarragon).—A South Australian production. A satisfactory yielder, holding the grain well. Straw of medium height, with white erect, slightly tip-awned ears.

Union (Federation x Cowra 15).—A short strawed, brown eared variety of similar season to Federation. Yielded fairly well, did not shatter, showed traces of flag smut.

Bena (natural crossbred between Hard Federation and Marshall's No. 3). —Yielded well in the late sown grain trial. Although traces of flag smut were present, it was superior to Hard Federation in this respect. Shattered slightly.

Cadia (Cleveland x Lambrigg Australian Talavera x Jumbuck x 9F).— A late seasoned variety with tall straw and light coloured, drooping head. A fair yielder but is more suited to cooler parts.

Bredbo (similar to Bena).—This variety is not as vigorous and robust as Bena. This season it was badly infected with flag smut, being the worst of the varieties under trial.

Duri (Hurst's 14 x Canberra).—An early manuring grain variety, suited to this district; yields better than Canberra and showed more resistance to disease. Although not holding the grain very well, it is in this respect superior to Canberra.

Bobin (Thew x Steinwedel).—One of the most promising of the new early maturing varieties. Straw of medium height with a brown, slightly tip-awned ear; holds grain fairly well.

Bald Early (selection from Improved Steinwedel).—An early maturing variety with medium tall straw and erect bald ears. Yields well but shatters slightly.

Nabawa (Gluyas Early x Bunyip).—An early maturing variety from Western Australia. In this season's trial yielded well, but shattered slightly. It is very resistant to flag smut.

Cookapoi (Bred by Mr. S. Plowman, of Parkes).—A short strawed early maturing variety, yields fairly well, but shatters slightly.

Plowman's 67 (another of Mr. Plowman's breeding).—A tall erect-growing variety, with slender tapering ears. A fair dual-purpose variety.

Bogan (Bred by Mr. Plowman, of Parkes).—Early maturing, short strawed, tip bearded.

Canberra (Federation x Volga Barley).—An early maturing variety; this season did not yield up to expectations. Loose smut was very prevalent.

Boonoo (Steinwedel x Yandilla King x Zaff).—An early maturing variety; did not yield at all well this season and shelled badly.

"The Home Garden Handbooks."

This series, edited by F. F. Rockwell, and published by the Macmillan Company, is planned to give as briefly as possible, information needed to enable one to operate a home garden with success. The series consists of half a dozen volumes in the meantime, of which two have reached us from the publishers—one dealing with shrubs and the other with gladiolus. They comprise something under 100 pages, and while quite presentable in appearance are intended to be offered at a price within the means of every home-owner.

In "Shrubs" are offered suggestions for the layout of the small, private garden, the different types of plants that are available, and their handling and care, and a lengthy list of plants and their various utilities.

In "Gladiolus" chapters are devoted to the place of the flower in the garden, its types and varieties, propagation, harvesting and storing, its pests and diseases, and the growth of the flowers for decorative and commercial purposes.

Both are useful little works, and allowing for differences in methods in oversea countries, they will be found handy to almost any flower lover.

Cross Pollination in the Cherry Orchard.

ATTACKING THE PROBLEM IN CALIFORNIA.

WHEN laying out a cherry orchard, provision should be made for cross pollination. It is quite certain that some varieties of cherries are self-sterile, and, moreover, that some are inter-sterile with certain other varieties; consequently it is not sufficient that a self-sterile variety be planted in close proximity to another variety that blossoms at the same period, but it is necessary that the other variety be capable of fertilising the self-sterile variety, or two self-sterile varieties should be inter-fertile.

According to the *Pacific Rural Press* (California), the cherry growers of the Beaumont district in Southern California have decided to attack the problem of self-sterility and inter-sterility of cherry varieties in a most practical manner. The data that is available on the whole subject of cross-pollination is too meagre at the present time to enable anyone to proceed with interplanting of varieties with the assurance that he is doing absolutely the right thing, and the work that is being undertaken at Beaumont might well be also commenced in many other places.

Soil and Climate are also Factors.

In general the orchards of Beaumont have produced very well, but there are seasons when a partial or entire crop failure can only be accounted for on the basis of lack of cross-pollination. This problem is, of course, encountered more in some orchards than in others, for in some cases inter-planting has been done without an accurate knowledge of the best varieties that can be used to inter-pollinate one another. This problem the growers of the Beaumont section have themselves decided to attack. They are employing a specialist to conduct some experiments along the lines of cross-pollination, and he and his assistant expect to hand-pollinate flowers to determine their compatibility with the pollen of flowers of other varieties; they also expect to place branches of one variety, upon which the blossoms have come out, in trees of other varieties, so that at the end of the season they may have some important data.

The difference in behaviour of varieties as they grow under conditions of soil and climate that are variable is such as to render the kind of work contemplated of the greatest importance. This difference creates a problem that can best be solved right in the community where the fruit is grown. Those who have made a special study of the pollination problem are well aware of the fact that a variety may be highly self-sterile in one locality, and may set fairly good crops of fruit in another locality. A good example of this characteristic may be found in the Williams pear. This variety is known to do well when not influenced by the pollen of other varieties in a few places where it is grown; in other places it bears very lightly if at all, because the conditions of soil and climate are such as to make cross-pollination necessary.

Paspalum Renovation Experiments.

WOLLONGBAR EXPERIMENT FARM, LISMORE.

J. N. WHITTET, H.D.A., Agrostologist; D. V. DUNLOP, H.D.A., and R. N. MEDLEY, H.D.A., Experimentalists.

WITH the object of improving paspalum pastures, which had deteriorated in regard to carrying capacity, experiments were initiated at Wollongbar Experiment Farm in May, 1924.

The area was originally typical "Big Scrub" country. The organic matter of the red volcanic soils of this class of land in the Lismore and other districts has, through heavy rainfall and over-stocking, been considerably depleted, thus resulting in a diminution of the fertility of the soil. By turning under the paspalum sod and sowing a cover crop such as oats, a legume, or suitable winter-growing pasture grasses and clovers, the ultimate results obtained from such procedure, together with the decomposition of the paspalum sod will be of a beneficial nature. A rapid growing bulky grass, such as paspalum, must in time vastly diminish the fertility of the soil, and to make up for such a deficiency the application of fertilisers is necessary.

The value of Kikuyu grass as a means of improving worn-out paspalum pastures and providing a change of feed from the latter, was demonstrated even in the early stages of the trials. Kikuyu thrives in this friable soil, making rapid progress and ultimately choking out the paspalum. It is therefore a useful plant to work in amongst established paspalum, and especially so on steep hillsides, as it is a turf-former and keeps the soil from washing, and is also serviceable for planting amongst ploughed paspalum sod. Where the roots of Kikuyu cannot be worked in with the plough, in situations such as on stony hillsides, a mattock or hoe should be used to bury the roots one or two inches deep in order to prevent stock from pulling them out of the ground during the early stages of growth.

The area selected was an old paspalum paddock in which the grass had produced very unsatisfactory growth for some time past. The soil was red volcanic loam, typical of the Richmond River district. The trials were located on slightly undulating land. The average annual rainfall at Lismore for the last thirty-nine years is 50·96 inches.

SEASON 1924-25 EXPERIMENTS.

Section 1.

This section consisted of eight plots, each ⅜ acre in extent, the arrangement being:—

Plot 1.—Check; untreated; left in paspalum.

Plot 2.—Ploughed in May; left in sod; worked down and allowed to revert to paspalum.

Plot 3.—Ploughed in May; worked down; oats sown June and fed off; allowed to revert to paspalum.

Plot 4.—Ploughed in May; worked down; vetches sown in June; ploughed in; allowed to revert to paspalum.

Plot 5.—Ploughed in May; worked down; Saccaline sorghum sown broadcast and cut for green feed; ploughed; allowed to revert to paspalum.

Plot 6.—Ploughed in May; worked down; Velvet beans sown in September and fed off; ploughed; allowed to revert to paspalum.

Plot 7.—Ploughed in May; Velvet beans sown in September and fed off; ploughed; Velvet beans sown again the following September; allowed to revert to paspalum.

Plot 8.—Ploughed; Kikuyu grass roots planted in August, 1924.

The ploughing of plots 2 to 8 inclusive was carried out in May, 1924, 2 cwt. of superphosphate per acre being applied throughout.

Detailed treatment of Plots (*Section* 1).—Plots 2 to 8 inclusive were ploughed with a single-furrow mouldboard plough.

Plot 1.—Two cwt. superphosphate per acre applied on 24th June, 1924. This plot was mown for weights on 16th January, 1925, but owing to wet weather no weights were obtained. Again mowed 27th May, 1925, when the average height was 18 inches but somewhat patchy.

Plot 2.—Ploughed on 20th May, 1924; disc cultivated 29th May, 1924, and again on 25th June, 1924. Superphosphate was applied at the rate of 2 cwt. per acre on 24th June, 1925. The plot was mowed twice (on 22nd September, 1924, and on 16th January, 1925), so as to keep down weed growth. Paspalum grew rapidly on this plot, reaching a height of 4 feet (excluding seed heads) with a thick uniform growth. It was cut for weights on 20th March, 1925.

Plot 3.—Ploughed on 20th May, 1924, and disc cultivated 29th May, 1924. Sunrise oats, broadcast at 2 bushels per acre, were sown on 24th June, 1924, together with superphosphate, 2 cwt. per acre. Disc cultivated to cover grain on 25th June, 1925, and rolled 27th June, 1925. A very fair germination of oats was obtained and the crop was cut with a mower on 22nd September, 1924; second growth was cut on 22nd November, 1924; plot disc ploughed on 4th December, 1924, and then cultivated.

Plot 4.—Ploughed on 20th May, 1924, and disc cultivated on 29th May, 1924. Golden vetches (40 lb per acre), together with superphosphate (2 cwt. per acre), were broadcasted 25th June, 1924, and covered with a disc cultivator on 25th June, 1924; rolled 27th June, 1924. A good germination was obtained and strong growth resulted. A heavy crop was ploughed under on 3rd December, 1924. Disc cultivated and harrowed on 23rd January, 1925.

Plot 5.—Ploughed 20th May, 1924. Disc cultivated on 2nd June, 1924, and again on 14th August, 1924, and 23rd September, 1924. Saccaline was broadcasted at the rate of 35 lb. per acre, together with superphosphate at 2 cwt. per acre, and seed was covered with a disc cultivator. A fair germination was obtained but the growth was only fair. Paspalum came on strongly in this plot, and in patches almost smothered the saccaline. The saccaline was cut and fed to dairy stock. The plot was again ploughed on 20th April, 1925; disc cultivated and harrowed on 22nd April, 1925.

Plot 6.—Ploughed on 20th May, 1924, and disc cultivated both ways on 2nd June, 1924, 14th August, 1924, and 23rd September, 1924. Half the plot was sown with velvet beans and half with Dolichos lab-lab on account of the shortage of velvet bean seed. Drills were

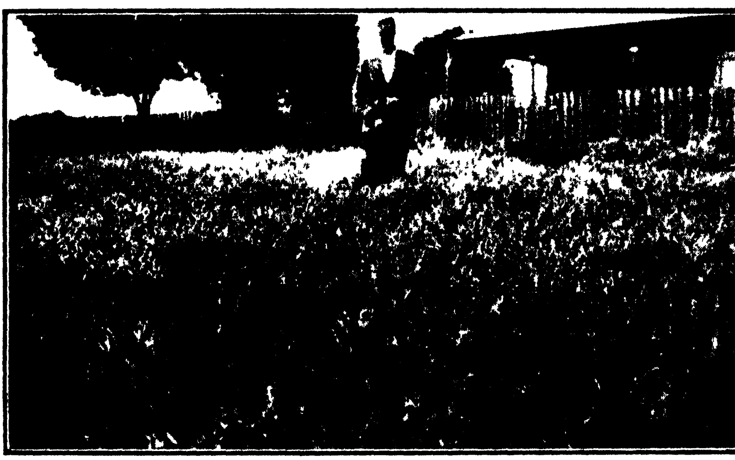


Fig. 1.—Kikuyu Grass has crowded Paspalum out on this Section.
The roots of kikuyu were planted here (Plot 8, Section 1) during August, 1924, on ploughed paspalum sod; photograph taken April, 1927.

opened up 4 feet apart, and seed dropped every 8 inches. Superphosphate, 2 cwt. per acre, was broadcasted. A very fair germination was obtained and both crops made very good growth. Dairy cattle were turned in on this plot on 21st February, 1925, and they ate both crops readily. Residue was ploughed in on 3rd March, 1925, and disc cultivated and harrowed on 11th May, 1925.

Plot 7.—Ploughed on 20th May, 1925, and disc cultivated both ways on 2nd June, 1926, 14th August, 1924, and 23rd September, 1924. Subsequent treatment and crops as per details under plot 6. Velvet beans were again sown in this plot in September, 1925, after which it was allowed to revert to paspalum. Owing to heavy rains commencing on 4th March, 1925, ploughing of this plot was not completed until 28th April, 1925. It was disc cultivated and harrowed on 11th May, 1925.

Plot 8.—This plot was ploughed and Kikuyu grass roots put in with a mattock, 6 feet each way, on 14th August, 1924. It made steady growth during the summer and rapid headway in the autumn; by July, 1925, the plot consisted of 60 per cent. Kikuyu and 40 per cent. paspalum.

Results (*Section* 1).—Up to May, 1925, the yields were :—

Plot 1.—19 cwt. 1 qr. per acre.

Plot 2.—3 tons 5 cwt. 2 qrs. 14 lb. per acre.

Section 2.

This section consisted of a paspalum cultivation and fertiliser trial, the cultivation being carried out with an implement termed a "rooter"—a strong rigid-tine cultivator type of machine, specially constructed for tearing up the surface soil of paspalum paddocks.

Seven plots in all, each one-third acre, were included in the trial, as follows:—

Plot 1.—No fertiliser and uncultivated.

Plot 2.—No fertiliser and cultivated.

Plot 3.—Cultivated; top-dressed in late winter with P7 (equal parts bonedust and superphosphate), 2 cwt. per acre.

Plot 4.—Cultivated; top-dressed in late winter with superphosphate, 2 cwt. per acre.

Plot 5.—Cultivated; top-dressed in late winter with sulphate of ammonia, ½ cwt. per acre.

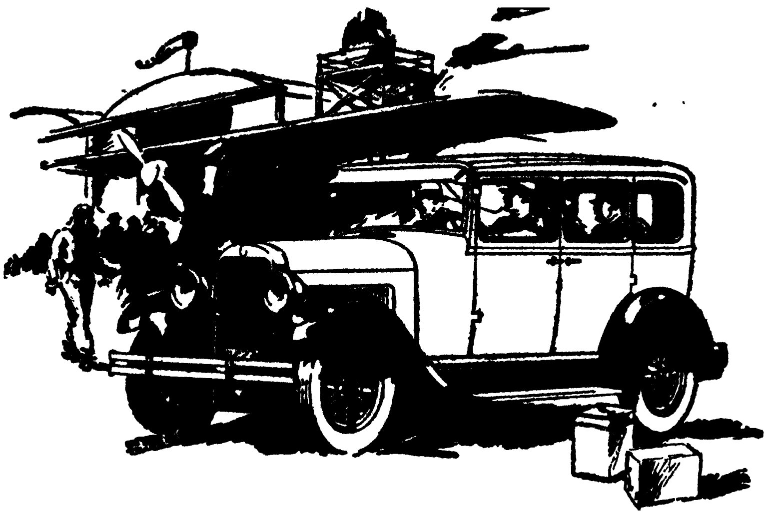
Plot 6.—Cultivated; top-dressed in late winter with superphosphate 2 cwt. and sulphate of ammonia ½ cwt. per acre.

Plot 7.—Cultivated; top-dressed in late winter with basic superphosphate, 2 cwt. per acre.

All plots except No. 1 were treated with the "rooter" on 19th June, 1924, and the manures applied on 24th June, 1924.

The plots were cut on 15th January, 1925, but heavy rain prevented the weights being obtained. Before this cut, Plot 7 (treated with basic superphosphate) was showing up very well, the grass making vigorous growth, and all the manured plots were superior to Plot 2, which in turn was better than Plot 1—the latter made practically no growth. At this cut, the average height of the fertilised plots was about 1 foot, excluding seed stems. A noticeable feature was the vigorous growth of white clover in the "rooted" plots, while there was practically none in Plot 1.

Plots 1, 2, 3, and 4 were cut for weights on 25th March, 1925. Owing to rain setting in, Plots 5, 6, and 7 were not cut until 11th May, 1925. Before the second cut the difference in the plots was again marked, No. 7 (basic superphosphate) again showing out superior to any other, and being 15 inches



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in height. Plots 5, 6, 4, 3, and 2 were not as good, but in that order were all superior to Plot 1, which had remained practically stationary. The clover growth was again very strong.

Results (Section 2).—The weights cut per acre from the different plots were as follows :—

Plot 7	... ...	17 cwt.	1 qr.	18 lb.	per acre.
„ 5	... ...	15 „	3 „	6 „	„
„ 6	... ...	14 „	2 „	26 „	„
„ 4	... ...	13 „	3 „	20 „	„
„ 3	... ...	12 „	2 „	12 „	„
„ 2	... ...	11 „	3 „	4 „	„
„ 1	... ...	9 „	1 „	14 „	„

The rainfall from the time of "rooting" to the last cut was 80·84 inches.

SEASON 1925-26 EXPERIMENTS.

Section 1.

The trials were continued, and results obtained from all plots in this section with the exception of No. 7 which was under velvet beans. In Plots 3, 4, and 6 the paspalum had become fairly well established and made excellent growth. Plot 5, which was allowed to revert after a crop of saccaline was fed off and the stubble ploughed in, was the weakest, weed growth and self-sown saccaline being present. The paspalum grew as tall as in the other plots, but failed to "thicken up" rapidly.

It will be noted from the results below that Plot 2 is on top, but it had two years to recover from the ploughing as against one year in the case of the other plots. The average of all plots, with the exception of No. 1, was 5 feet high and the grass made very heavy thick leaf growth. Plot 1 averaged only 2 feet in height. Little difference could be noted between Plots 3 and 6, the grass in these being much thicker than in the others.

Results (Section 1).—All plots were cut on 15th January, 1926, and the following table shows acre weights :—

Plot 2	... ...	5 tons	16 cwt.	3 qr.	24 lb.
„ 6	... ...	5 „	4 „	1 „	24 „
„ 3	... ...	4 „	11 „	3 „	24 „
„ 4	... ...	3 „	11 „	1 „	20 „
„ 5	... ...	3 „	0 „	2 „	4 „
„ 1	... ...	2 „	7 „	1 „	8 „

Plot 7 was ploughed 7th May, 1925, disc cultivated and rolled, and sown on 18th September, 1925, with velvet beans which made fair growth. These were fed off, the plot ploughed, and then allowed to revert to paspalum.

On Plot 8 Kikuyu continued to make good growth and more than held its own with paspalum.

Section 2.

After the last cut in 1925 stock were turned on the plots to graze them down. The plots were top-dressed again with the same amount of fertilisers on 24th August, 1925. The season was an excellent one and all plots made

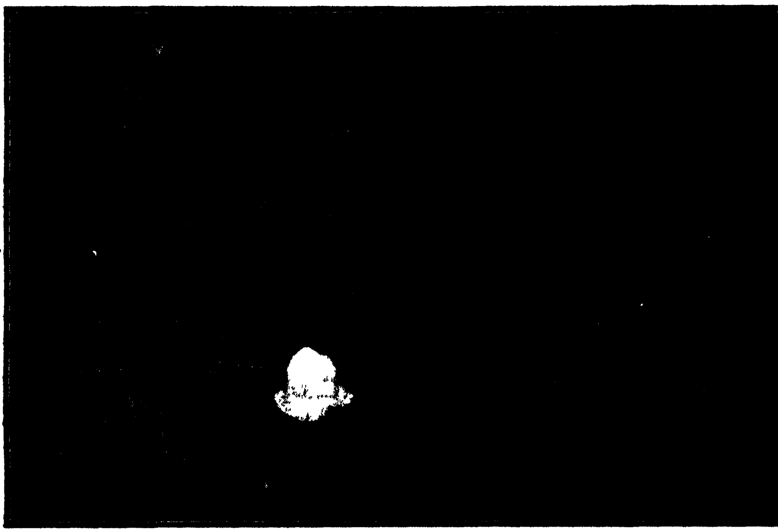


Fig. 2.—Unploughed Paspalum Plot, Section 1.
Photographed January, 1926.

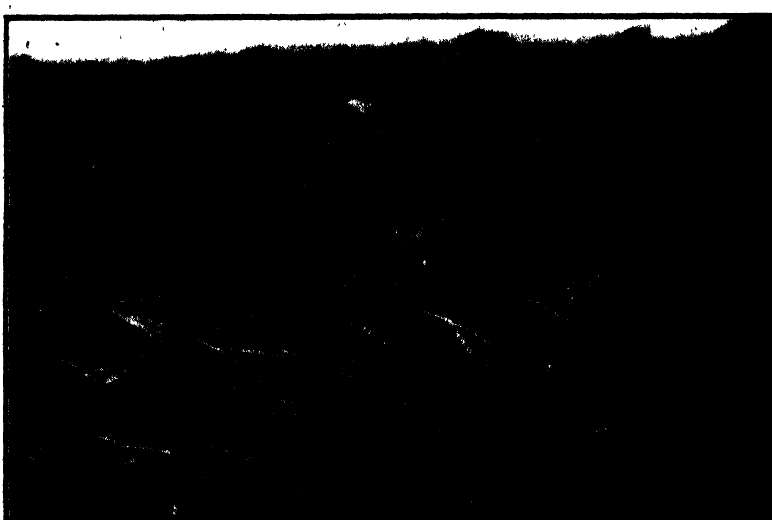


Fig. 3.—Ploughed Paspalum Plot, Section 1.
The area was ploughed in May, 1924, and photographed January, 1926.

good growth, although none of them could compare with those which had been ploughed in the other sections.

At the time of cutting the untreated check plot averaged 18 inches in height and the fertilised and treated plots 2 feet, excluding seed stems. It will be seen from the results given overleaf that there was little difference between the treated plots and all were better than the check; in the heavier ones a slightly thicker growth of grass was noticeable.

Fig. 4.—The same Area as Fig. 2.

Photograph taken in November, 1927. Note the unevenness of the growth compared with Fig. 5.

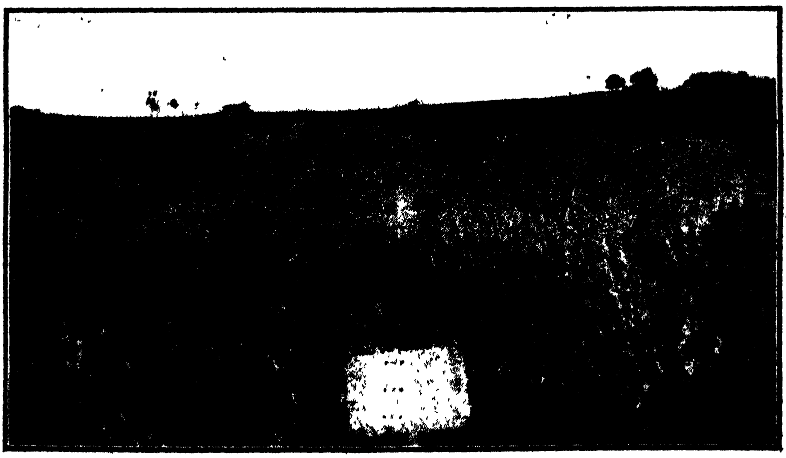


Fig. 5.—The same Area as Fig. 3.

Photograph taken in November, 1927. Compare this with Fig. 4, and note that even three years later the effect of the ploughing is still in evidence.

Results (*Section* 2).—The plots were cut and weighed on 25th January, 1926 :—

Plot 7	yielded 2 tons	11 cwt.	3 qr.	4 lb.	per acre.
„ 3	„ 2 „	10 „	0 „	0 „	„
„ 5	„ 2 „	8 „	0 „	24 „	„
„ 4	„ 2 „	4 „	2 „	16 „	„
„ 2	„ 2 „	2 „	3 „	12 „	„
„ 6	„ 2 „	2 „	3 „	12 „	„
„ 1	„ 1 „	7 „	2 „	20 „	„

The rainfall between 11th May, 1925, and 25th January, 1926, was 47·20 inches.

Section 3.—Ploughing and Manurial Trials.

In 1925 the following additional plots were included in the experiments :—

Plot 1.—Ploughed; Bokhara clover seed sown.

Plot 2.—Ploughed; top-dressed with 2 cwt. superphosphate per acre.

Plot 3.—Ploughed; top-dressed with 2 cwt. superphosphate and ¾ cwt. sulphate of potash per acre.

Plot 4.—Ploughed; top-dressed with 2 cwt. basic superphosphate per acre.

Plot 5.—Ploughed; top-dressed with 2 cwt. superphosphate, 56 lb. sulphate of ammonia, and ¾ cwt. sulphate of potash per acre.

Plot 6.—Ploughed; top-dressed with 2 cwt. superphosphate, 70 lb. nitrate of soda, and ¾ cwt. sulphate of potash per acre.

Plot 7.—Ploughed; no manure.

Plot 8.—Check; untreated.

All plots were allowed to revert to paspalum.

The land selected was typical worn-out paspalum pasture, and located in the same paddock as the other trials. All plots were ploughed 19th, 20th, and 21st August, 1925; disc cultivated on 26th August, 1925; rolled 28th August, 1925; and harrowed 28th September, 1925. The top-dressings of manures were applied to the plots in October, 1925.

Bokhara clover seed was broadcasted on Plot 1 on 27th October, 1925, and harrowed in, but it failed to germinate. The grass in all the other plots made excellent growth, being much thicker in the manured than in the unmanured. The average height was 5 feet 6 inches, whilst that of the untreated check plot was 18 inches.

Results (*Section* 3).—All plots were cut on 18th January, 1926, and the following were the weights obtained per acre :—

Plot 3	... ...	6 tons	[illegible]	[illegible]	[illegible]
„ 2	... ...	5 „	17 „	3 „	12 „
„ 4	... ...	5 „	8 „	3 „	21 „
„ 5	... ...	3 „	14 „	0 „	12 „
„ 6	... ...	3 „	1 „	2 „	22 „
„ 7	... ...	2 „	19 „	3 „	8 „
„ 8	... ...	1 „	6 „	3 „	4 „

The season had been a particularly good one and very favourable to grass growth.

"Rooter" Trial Discontinued.

In 1926 it was decided to discontinue the "rooter" trial, as the effect of the working given with this implement was not apparent during the period February to December, 1926. Any implement of the cultivator type only disturbs the soil around the plants, whereas ploughing improves the fertility of the soil by turning under a large quantity of organic matter, in addition leaving the land in a suitable condition for the plants to develop vigorous healthy rooting systems.

Stocking of the Paddocks.

After the cutting of the plots was completed in January, 1926, Sections 3 and 1 were thrown open to stock and were grazed until August and December respectively; and then closed to allow the plots to make growth for cutting. This procedure was adopted in order to ascertain whether stock exhibited preference for the growth resulting from any particular treatment, and also to test the residual effect of any of the original operations.

During the grazing period it was very noticeable that the stock showed a decided preference for the grass on the renovated plots; rarely were the animals to be seen feeding on the untreated and unploughed areas. On the ploughed pastures the grass makes more rapid growth than that on the unploughed plots, and during the dry period experienced in October, November, and December, 1926 (only 136 points of rain falling), the treated areas were fresh and succulent in comparison with the unploughed, which were not making any growth, but were burning off rapidly.

From mid-December onwards heavy and consistent rains were experienced accompanied by high temperatures, which greatly forced the growth of paspalum. The rapidity of growth was remarkable, a height of between 5 and 6 feet being attained in as many weeks. The stooling was correspondingly heavy.

SEASON 1926-27 EXPERIMENTS.

Section 1.

The height of the grass on the plots was fairly uniform, averaging about 5 feet 6 inches, the density of which varied greatly, being lowest on Plots 1 and 5. The Kikuyu on Plot 8 made good growth, and now constituted 95 per cent. of the pasture, almost entirely choking out the paspalum.

Results (*Section* 1).—Harvesting and weighing of the plots was carried out on 18th February, 1927. The weights obtained were as follows:—

Plot 3	...	9 tons	13 cwt.	0 qr.	20 lb.	per acre.
,, 6	...	9 ,,	7 ,,	2 ,,	0 ,,	,,
,, 7	...	9 ,,	5 ,,	2 ,,	24 ,,	,,
,, 2	...	9 ,,	4 ,,	2 ,,	1 ,,	,,
,, 4	...	9 ,,	3 ,,	3 ,,	20 ,,	,,
,, 1	...	8 ,,	7 ,,	0 ,,	0 ,,	,,
,, 8	...	*8 ,,	4 ,,	1 ,,	4 ,,	,,
,, 5	...	7 ,,	18 ,,	3 ,,	20 ,,	,,

*Growth of Kikuyu grass chiefly.

The rainfall for twelve months ending 31st January, 1927, was 57·70 inches.

A review of these results shows that there is a relationship between the yields of the various plots and the type of plant with which the plot had been cropped previously. The effect of a previous crop on the succeeding growth of grass is most outstanding in the case of the two plots which had been cropped with velvet beans. Legumes are renowned soil renovators, and the influence of the velvet bean crop is shown in the yield of grass taken off the plot more than two years after the land was under crop.

That the cultivation methods necessary to establish sorghum detrimentally affect the subsequent growth of grass is illustrated by the yields obtained from Plot 5 during 1926 and 1927. Oats exerted quite a pronounced effect during 1926 and 1927. Though not possessing the same valuable renovating properties as legumes, it occupies an important place in the general farm practice in this area, being a crop widely grown during the winter season for

Fig. 6.—A Well Ploughed Paspalum Paddock, showing Young Growth coming on.
The young growth is seen between the furrow slices. The area had been ploughed with a mouldboard plough. Note the evenness of the surface of the paddock.

green fodder purposes. This point is vastly in its favour for use in the operations of renovating paspalum pastures in this district in cases where the farmer is desirous of using a crop in the process.

Up to the present the trials indicate that ploughing the pasture and allowing it to revert to paspalum without cropping shows to greatest advantage in the first year succeeding the "breaking up," after which time the effect gradually declines. It is perfectly obvious that greater benefits are derived from use of crops in the renovating process than where the pasture is simply "broken up" and allowed to revert. The stimulating influences of the cropping are not so apparent in the first year after the cropping; in fact, the ploughing without cropping shows to greater advantage in that year, but in the second year the effect of the cropping shows up to a very marked extent

The farmer may utilise any of the crops tried in this experiment, some to greater advantage than others, as in all cases the cropped plots yielded more heavily than the unploughed plot, whilst the quality of the herbage on these plots was far superior. Another aspect in favour of the use of crops in the renovation of paspalum pastures is the return the farmer obtains from the renovating crop itself; this return will repay, to a certain extent, for the labour and cost involved in renovating the pasture.

Section 3.

The plots in this section were grazed from the date of the last harvest, 18th January, 1926, until 1st September, 1926, when they were closed to allow growth for the recording of weights. Practically no growth was made during the spring months owing to the dry conditions that prevailed. On

Fig. 7.—A Badly Ploughed Paspalum Paddock.

The unevenness is due to the area being turned over with a disc plough; compare with Fig. 6.

17th September, 1926, half of each plot (Nos. 2 to 6 inclusive) was top-dressed similarly to the previous year's application in order to compare the results obtained from top-dressing every year with applications made once every two years. No growth was made until the rains of mid-December, but from that time onward the grass progressed rapidly and was fit for cutting in the middle of February. The growth in this section was much heavier than last season, though not as heavy as that in Section 1 this season. This may be attributable to the longer period which the grass had in Section 1 to re-establish itself. The average height was 5 feet 6 inches for the ploughed plots as against from 6 inches to 3 feet on the unploughed one. The growth was not so dense in this section as in Section 1.

The trial now comprises:—

Plot 2A.—Ploughed; top-dressed with 2 cwt. superphosphate per acre in 1925.

Plot 2B.—Ploughed; top-dressed with 2 cwt. superphosphate per acre in 1925 and 1926.

Plot 3A.—Ploughed; top-dressed with 2 cwt. superphosphate and ¾ cwt. sulphate of potash per acre in 1925.

Plot 3B.—Ploughed; top-dressed with 2 cwt. superphosphate and ¾ cwt. sulphate of potash per acre in 1925 and 1926.

Plot 4A.—Ploughed; top-dressed with 2 cwt. basic superphosphate per acre in 1925.

Plot 4B.—Ploughed; top-dressed with 2 cwt. basic superphosphate per acre in 1925 and 1926.

Plot 5A.—Ploughed; top-dressed with 2 cwt. superphosphate, ¾ cwt. sulphate of potash, and ½ cwt. sulphate of ammonia per acre in 1925.

Plot 5B.—Ploughed; top-dressed with 2 cwt. superphosphate, ¾ cwt. sulphate of potash, ½ cwt. sulphate of ammonia per acre in 1925 and 1926.

Plot 6A.—Ploughed; top-dressed with 2 cwt. superphosphate, ¾ cwt. sulphate of potash, 70 lb. nitrate of soda per acre, 1925.

Plot 6B.—Ploughed; top-dressed with 2 cwt. superphosphate, ¾ cwt. sulphate of potash, 70 lb. nitrate of soda per acre, 1925 and 1926.

Plot 7.—Ploughed; unmanured.

Plot 8.—Unploughed; unmanured.

The rainfall was the same as for Section 1. Harvesting operations were carried out on 17th February, 1927.

Results (*Section* 3).—The "A" plots received applications of fertiliser in 1925 only:—

Plot 3A	... ...	7 tons	15 cwt.	0 qr.	0 lb.	per acre.
,, 4A	... ...	7 ,,	12 ,,	1 ,,	4 ,,	,,
,, 2A	... ...	6 ,,	3 ,,	3 ,,	27 ,,	,,
,, 6A	... ...	5 ,,	13 ,,	2 ,,	6 ,,	,,
,, 7	... ...	5 ,,	13 ,,	1 ,,	13 ,,	,,
,, 5A	... ...	5 ,,	3 ,,	2 ,,	9 ,,	,,
,, 8	... ...	3 ,,	7 ,,	3 ,,	7 ,,	,,

Average of Plots 2 to 6 was 6 tons 9 cwt. 2 qr. 20 lb. per acre.

The "B" plots received applications of fertiliser in 1925 and 1926:—

Plot 6B	... ...	7 tons	2 cwt.	2 qr.	8 lb.	per acre.
,, 3B	... ...	6 ,,	13 ,,	3 ,,	20 ,,	,,
,, 2B	... ...	6 ,,	9 ,,	0 ,,	24 ,,	,,
,, 4B	... ...	6 ,,	3 ,,	1 ,,	18 ,,	,,
,, 5B	... ...	6 ,,	1 ,,	1 ,,	3 ,,	,,
,, 7	... ...	5 ,,	13 ,,	1 ,,	13 ,,	,,
,, 8	... ...	3 ,,	7 ,,	3 ,,	7 ,,	,,

Average of Plots 2 to 6 was 6 tons 10 cwt. 0 qr. 9 lb. per acre.

The results indicate that in this type of country the greatest benefit is derived from the application to the "broken up" paspalum pasture of any one of the following:—Superphosphate, basic superphosphate, or superphosphate and sulphate of potash. As far as yield is concerned a mixture of superphosphate and sulphate of potash gave the greatest return, its action being as strong in the second year after application as in the first. A different point of view presents itself when the monetary side is considered. The approximate cost of the fertilisers per acre would be:—Superphosphate, 12s.; basic superphosphate, 15s.; and superphosphate and sulphate of potash, 25s. Prices are f.o.b. Sydney. This swings the balance in favour of either superphosphate or basic superphosphate. The most outstanding feature of the 1926-27 season's trial is the extraordinarily heavy growth of grass produced; and without doubt this can be accounted for by the very favourable growing conditions that prevailed. It is during the months of December, January, and February that paspalum makes its greatest development, and these months were all that could be desired for the encouragement of growth.

Summary.

Ploughing and top-dressing with phosphatic fertilisers are the chief methods of improving paspalum pastures which can be adopted in the Lismore district.

In Section 3 the average weight of the cuttings made during the 1926 and 1927 seasons showed that ploughing alone gave nearly 2 tons per cut per acre more green material than the unploughed area, whereas an additional 37 cwt. per cut was obtained by the application of 2 cwt. superphosphate per acre to the ploughed pasture.

The residual effect of the ploughing carried out in 1925, plus an application of 2 cwt. superphosphate made in that year, is an important feature of Section 3, as the following weighings which were obtained from a cutting made on 17th February, 1927, indicate:—

Unploughed; no manure	3 tons	7 cwt.	3 qr.	7 lb.
Ploughed; no manure	5 ,,	13 ,,	1 ,,	13 ,,
Ploughed; 2 cwt. superphosphate...	6 ,,	3 ,,	3 ,,	27 ,,

Superphosphate was more active than basic superphosphate during the first twelve months of the trial; the latter fertiliser, however, produced somewhat higher yields in the second year.

Kikuyu grass provides a valuable change of feed from paspalum, and is useful for working in amongst areas of the latter.

Stock show a marked preference for ploughed and top-dressed areas, the feed produced being evidently very palatable and more nutritious than on untreated plots.

The experiments at Wollongbar Farm (Lismore) are to be continued for a number of years in order to determine the residual effects of the application of fertilisers and ploughing operations. An extension of the top-dressing trials to unploughed paspalum will also be undertaken during 1928 as a continuation of the work already conducted on this class of pasture on private farms. The results of the latter trials were published in last month's issue of the *Agricultural Gazette.*

FITZROY SEED MAIZE CONTEST.

WITH a view to stimulating seed maize improvement by selection among farmers, a competition was carried out at Grafton Experiment Farm last season, growers of Fitzroy being invited to submit 5 lb. samples of seed in order that they might be grown under uniform conditions and a certificate of merit be awarded to the owner of the highest-yielding sample. The following farmers responded:—

F. W. Hill, Yarramalong, via Wyong. Seed fair sample, sound, medium depth, somewhat lacking in lustre and weight.

J. P. Mooney, Taree. Seed good sample, sound. true to type, good width, medium depth, bright, and heavy.

F. Cannane, Coraki. Seed sound, off type, very shallow, rounded grain, medium heavy.

T. Grainger, Southgate-road, Clarence River. Good seed, sound, true to type, deep, slightly uneven.

R. W. Hindmarsh, Bellingen. Good seed, sound, true to type, good width, medium depth, slightly uneven, bright and heavy.

W. Murray, Kolodong, Taree. Fair seed, very slightly damaged by weevil, medium depth, somewhat lacking lustre and weight.

R. W. Leonard, Great Marlow, Clarence River. Deep grain, true to type, but damaged by weevil.

The spring and early summer proved extremely dry, and planting was delayed until 7th January, when the land was in good condition and well supplied with moisture. Following very heavy rains in January useful showers fell until the middle of April, after which it was drier again. The trial was located on black alluvial flat adjoining Alumny Creek, capable of producing heavy crops. The trial was planted in duplicate, with Fitzroy maize supplied by Grafton Experiment Farm in every second plot as a check. The ground was well prepared and cultivation after sowing was good, but owing to late planting the crop was caught by frost and the grain was slightly pinched. Harvesting took place between 18th and 25th August. The following are the average yields of the duplicate plots:—

	bus.	lb.
R. W. Hindmarsh, Bellingen	68	37
Grafton Experiment Farm (average of checks)	67	38
T. Grainger, Southgate-road	67	29
J. P. Mooney, Taree	65	42
F. Cannane, Coraki	63	23
W. Murray, Taree	58	23
F. W. Hill, Wyong	57	1
R. W. Leonard, Great Marlow	31	55

—R. J. DAVIDSON, Experimentalist.

ALL agricultural research is directed to the one objective of enabling farmers to draw a bigger return from their land. The objective is of national dimensions, for even handsome improvements on a few exceptionally well-run, well-circumstanced farms will do little for the industry as a whole.

Bacon Production on the Farm.

A Profitable Line.

S. MEREDITH, Alstonville.

IN the June and July issues of the *Agricultural Gazette* appeared a plea for more attention to the raising of pigs in this State, the title of the article being "Why not more Pigs?" and the author Mr. W. L. Hindmarsh, M.R.C.V.S. Many farmers are under the impression that it is not profitable to breed and fatten pigs unless it is done in conjunction with dairy farming, or unless buttermilk is available from time to time from some nearby factory. Even where these conditions exist the number of pigs that can be kept is not realised, most farmers only having a quarter of the stock that could be profitably bred and fattened.

The reason for these limited numbers appears to be that in times of drought the lack of feed means starvation, the general idea being that purchased feed means loss instead of profit. This impression is erroneous, however, as I hope to show from experiments that have proved successful. No farmer need fear drought as far as his pigs are concerned.

Actual tests have been carried out by me, as recently as the 1926 drought on the northern rivers of New South Wales, and the results then were slightly better than those quoted, but circumstances alter cases and the pigs used in the tests were pedigreed Berkshires.

The first essential is a good clover and grass paddock—not the poor scanty growth which is usually the lot of the pig, but as good as would be used for dairy cattle.

After the weaning of her litter, the sow that was used in the experiment was turned in to the boar and was in pig by the third or fourth day, from which date the costs commenced. The mixture used in the experiment was made up as follows:—

	s.	d.
56 lb. maize meal, costing	6	8
24 lb. pollard, at 1⅓d. per lb.	2	7
10 lb. M.I.B. "Pig-fil-up"	1	8
5 lb. lucerne meal	0	9
5 lb. linseed oil meal	0	10
100 lb., costing	12	6 or 1½d. lb.

This mixture gives an albumenoid rato of approximately 1 : 4·4 of *digestible* nutrients, and the pasture required would be approximately a ratio of 1 : 5, which is near enough for all practical purposes to a balanced ration.

The feed supplied to the sow during the period of gestation was as follows:—

	lb.
Ten weeks, 2 lb. mixture per day	140
Four weeks, 3 lb. day	84
Two weeks, 4 lb. day	56
	280

The cost of feeding the sow up to farrowing was, therefore, £1 15s.

Assuming that the litter consists of eight and that these are raised to weaning, the cost would be:—

	£	s.	d.
First day, nil.			
Second day, 2 lb. pollard, at $1\frac{2}{7}$d. per lb.	0	0	$2\frac{4}{7}$
Third day, 3 lb. pollard	0	0	$3\frac{6}{7}$
Fourth day, 2 lb. pollard and 2 lb. mixture ...	0	0	$5\frac{4}{7}$
Fifth day, 2 lb. pollard and 3 lb. mixture... ...	0	0	7
Sixth day, 1 lb. pollard and 4 lb. mixture... ...	0	0	$7\frac{2}{7}$
Seventh day, 6 lb. mixture	0	0	9
Three weeks at 6 lb. per day mixture	0	15	9
Sow (with young pigs feeding in a separate trough) one week, 7 lb. mixture per day	0	6	$1\frac{1}{2}$
Do., one week 8 lb. day	0	7	0
Do., two weeks (as sow's feed is decreased the young pigs' feed is increased) 10 lb. mixture per day	0	17	6
Total cost of sow and litter	£2	9	4

Adding the cost of feeding the sow till farrowing, £1 15s., we reach a total cost for sow and litter till weaning of £4 4s. 4d. In actual practice this came out at £4 3s. 6d. for a sow with a litter of ten pigs reared to eight weeks.

The sow is now turned out, and the eight young pigs only are dealt with, their costs being as follows:—

	£	s.	d.
One week at 2 lb. per head per day of mixture ...	0	14	0
One week at $2\frac{1}{2}$ lb. per head per day	0	17	6
Two weeks at 3 lb. per head per day	2	2	0
Six weeks at 4 lb. per head per day	8	8	0
Two weeks at 6 lb. per head per day	4	4	0
	16	5	6
Add cost to eight weeks old	4	4	4
Total cost of sow and litter	£20	9	10

The pigs should now be fit for the butcher, as prime bacon pigs that have not lost a day in making weight. They should dress out over 120 lb. each as the feed is such as will make a "hard" firm carcase, and therefore they should be worth at the lowest £3 10s. each. For eight weeks this spring similar pigs reached up to £4 18s. in the Lismore yards, and for the greater part of the year such animals would be worth £4 each. Taking the price at £3 10s. each, the eight would mean a cheque for approximately £28 at the factory.

This shows that a profit is possible even with this costly method of working, so that in a reasonable season, when much of the purchased foods could be

replaced by farm-grown fodder and grains, the profits would be largely augmented, or, in other words, the crops would be harvested at a good figure in addition to the profit on the stock.

For a farmer with other feeds, some indication might be given of replacements that might be made to assist in balancing the ration :—

1 lb. of mixture could be replaced by—
 8 lb. skimmed milk to, say, 50 per cent. (not wholly for the best results); or
 5 lb. whole milk; or
 10 lb. buttermilk.

As regards home-grown feeds, I would suggest the list given by Mr. H. W. Potts, late Principal of Hawkesbury Agricultural College, in his book "Pigs and their management," from which I have extracted the following :—

100 lb. maize in food constituents in pig feeding equals—

103 lb. barley;	598 lb. green lucerne;
106 lb. peas;	618 lb. parsnips;
117 lb. rye;	665 lb. Red or White clover (green);
118 lb. oats;	721 lb. carrots.
360 lb. potatoes;	

Another suggestion might also be made in this regard. Taking 100 lb. of ground maize as equalling 100 points for pig feeding, then—

Wheat would be worth	95 to 98 points.
Barley " "	95 points.
Rye " "	94 "
Grain sorghums "	80 "
Oats " "	75 "
Sweet sorghums "	63 "

This, of course, relates to ground grains only, and can only be taken as approximate, as these grains vary according to the protein supplement that is fed with them. The farmer who has shrivelled wheat that is unsuitable for milling purposes could grind it and utilise it in lieu of maize; likewise sweet potatoes and other root crops could be used, as outlined by Mr. Hindmarsh in the article referred to above.

With the ration given, and the list of maize substitutes, the pig feeder could easily learn to balance his rations, but for the purpose of saving calculation and labour, why not use the self-feeder ? I find that the simplest way of all is to use a self-feeder, of which there are many styles, and direction for which may be obtained from the Department of Agriculture. The main feature is that the pig helps himself as he feels the need of food, and takes it in the way best suited for his small stomach, namely, little and often. On a moonlight night the flaps of the self-feeder I have in use may be heard almost half the night banging down as one pig after another has its fill and leaves to have another sleep.

Rock salt and a mineral mixture of, say :—

30 lb. charcoal,
12 lb. wood ashes,
5 lb. flowers of sulphur,
5 lb. unslacked lime,
½ lb. copperas (powdered),

well mixed, and placed in a box or self-feeder out of the weather, will repay the little extra trouble and expense.

Water must always be provided for the pigs to drink, as they require it. *This is essential.*

What is most notable is the complete absence of the "runt" when the self-feeder is used. Even though there may be one or two runts in the number of pigs running together when first started on the feed, they will soon lengthen out, straighten up, and catch up with the others.

At first the pigs may be inclined to over-eat at the self-feeder, but that will soon pass when they see that there is no need to rush round to fill up all at once for all day, and although the total amount of feed eaten per day will probably be greater than the quantities I have shown in the experiment (where the feed was hand-fed for the purposes of especially checking quantities), still the pigs will be ready for market earlier and will consume less feed for 100 lb. live weight gain.

Although the profit shown does not seem to be much considering the outlay, it is better to make a small net profit and get the pigs to market than to feed a scanty ration for weeks and then have to feed heavily to top off. The latter method is costly, and not to be recommended, although where a farmer has plenty of skim milk that would otherwise be thrown away, there may be something to be said for the practice.

One word of warning might be added. This self-feeding is not for breeding stock, no matter what age they may be, as they become too fat and probably impair their breeding qualities, so that so far as that class of stock is concerned hand-feeding is a necessity.

"Agricultural Research in 1926."

Impressed with the difficulty experienced in obtaining publicity for the results of investigations in the science and practice of agriculture, and also with the danger that much valuable work should be lost sight of owing to the great number and variety of publications through which it is reported, the Research Committee of the Royal Agricultural Society, England, arranged for the issue of a volume, the object of which is to record yearly in concise form and in understandable terms the results of any work carried out in any part of the world that has a bearing upon agricultural practice in Britain.

The method adopted is to select some suitable authority and to ask him to summarise work done in the sphere in which he is interested, and this is done with such success that quite a quantity of work is brought together under a few headings. Recent work with crops and plant breeding, for instance, is summarised in the 1926 issue by F. L. Engledow, dairy husbandry work by J. Mackintosh, soils and fertilisers by Sir E. J. Russell, veterinary science by Sir J. MacFadyean, and so on. The result is a highly interesting and valuable collection of material and references, which is of use to scientific workers and farmers in almost any part of the world.

Published by the Royal Agricultural Society of England, London, from whom comes our copy.

Collection of Milk Samples for Mammitis.

H. R. SEDDON, D V.Sc., Director of Veterinary Research.

THE examination of milk samples provides the requisite information to determine the type of mammitis (or, as it is sometimes called, mastitis) with which a cow is affected. The most serious type is that due to a streptococcus, and commonly spoken of as "contagious," but it is well to remember that there are other types, and for successful control it is necessary to know with just what type one is dealing.

Hundreds of milk samples are sent to the Veterinary Research Station at Glenfield for examination, many coming from owners direct, and unfortunately, through want of knowledge as to how to collect samples, a large number of these are useless. For that reason we have frequently supplied owners with proper bottles and directions for collection. Other samples again are so contaminated that considerable time and labour are entailed in examining them. A properly collected sample is not only more satisfactory to work on, but requires a simpler examination. This article is therefore written to assist owners in the collection of samples, in order that by providing proper samples they may be furnished with an accurate diagnosis more quickly and with less trouble to themselves and to us.

It must, of course, be obvious that the most satisfactory method for the farmer would be for him to employ his own veterinary surgeon to examine his cows and to take the necessary samples for examination. If his veterinary surgeon is then employed to vaccinate, the farmer will be in a position to call upon him at any time, and he will know the exact situation on the farm. Where this procedure is not possible the Inspector of Stock for the district may be in a position to assist the farmer, but he is not always available, as should be the farmer's veterinary surgeon. It will, however, happen at times that an owner, particularly in some remote part of an Inspector's district, will desire an examination made urgently, and the following directions are therefore published for his benefit.

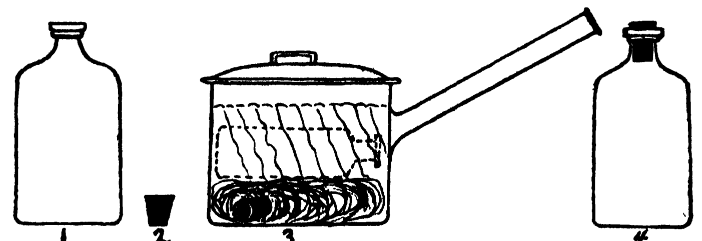
Sterilisation of Milk Sample Bottle.

Any bottle that will hold about 1 ounce (two tablespoonfuls) will do, but one with a rather wide mouth is to be preferred, as then the milk and clots will stream directly into the bottle without fouling the mouth. The next point is that it must be clean. It must show no trace of its previous contents —not even the odour of them. For this reason eucalyptus oil bottles are to be avoided, as they are difficult to clean thoroughly. Essence bottles are satistory if thoroughly washed. A clean cork is absolutely necessary. Frequently a dirty cork is used, and if it is from some essential oil bottle so much the worse. New corks are best.

The bottle must then be sterilised. This is really a simple matter, but before it is done the bottle and cork must be thoroughly clean. Take a small

saucepan and a clean piece of cloth about the size of a handkerchief. Fold the cork up in the cloth, place the folded cloth on the bottom of the saucepan, and pour in about 3 inches of water. Then fill the bottle with water and lay it on the cloth on the bottom of the saucepan. The cloth will keep the cork submerged and prevent the bottle breaking as it is bumped about in the boiling. Put on the lid and boil for five minutes; then set aside to cool.

When cool enough to handle, drain the saucepan (by tilting it up as a cook does when draining water off potatoes), take out the bottle, empty it of water and unwrap the cork. Place the cork in the bottle, taking care to hold the cork only by the wide end; dry the outside of the bottle with a clean cloth and put on a piece of gummed paper for a label. Two or three bottles may be sterilised at once, but they should be used the day they are sterilised. The bottle should not be opened until the sample is to be collected.



1 Bottle 3 Boiling Bottle & Cork
2 Cork 4 Sterilised Bottle.

Briefly, the operations are:—(1) Clean the bottle; (2) boil the bottle and cork for five minutes; (3) empty the water out of the bottle, and insert the cork.

Collection of Milk Samples.

It is a great help to have someone to assist; let him hold the bottle, while the milker brushes the loose hairs, scales, and dirt from the udder and the teat. Moisten a little bit of rag in methylated spirits, and with this wipe the teat; especially clean the ends of the teats. If no spirit is available, use a little clean water, and dry the teat with a clean cloth before taking the sample. On no account take milk from a wet teat. Washing the udder is, in my opinion, best avoided, as moisture invariably works down the teat.

Get the assistant to take the cork out of the bottle, holding the cork by the wide end, and to hand you the bottle. Then by stripping take a few squirts of milk from the affected quarter or quarters directly into the bottle, and hand it back to the assistant to cork it immediately, and label it with the name of the cow. Remember that the most valuable sample is

the first two or three squirts, which therefore must not be wasted by milking on to the ground. The bottle should, however, be filled, but not to overflowing.

Despatch of Samples.

The sample should now be packed, and sent addressed to The Director of Veterinary Research, Glenfield, by the quickest route. It is advisable to take samples as late as possible before the mail closes, and if the packet is being sent by post a letter giving full particulars should be forwarded by the same post; if sending by train, enclose the letter along with the sample. Remember to write the name and address on the label or enclose it with sample.

As soon as the examination has been completed, and this may take three or four days, a report will be furnished to the veterinary surgeon, or to the local Inspector of Stock, who will communicate with the owner and advise him regarding the control of the disease, if present.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
A. V. Chaffey, "Lilydale," Glen Innes	15	25 Jan., 1928
New England Girls' Grammar School, Armidale	17	30 ,, 1928
Lunacy Department, Kenmore Mental Hospital	99	1 Feb., 1928
Walaroi College, Orange	4	8 ,, 1928
Lunacy Department, Orange Mental Hospital	8	,, 1928
Australian Missionary College, Cooranbong	51	11 ,, 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 ,, 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	80	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 ,, 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	70	16 ,, 1928
Department of Education, Mittagong Farm Homes	30	22 ,, 1928
Sacred Heart Convent, Bowral	11	23 ,, 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 ,, 1928
Dominican Convent, Moss Vale	4	24 ,, 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	118	20 ,, 1928
Marist Brothers' Training School, Mittagong	80	25 ,, 1928
Blessed Chanel's Seminary, Mittagong	3	26 ,, 1928
J. L. W. Barton, Wallerawang	16	11 Oct. 1928
King Bros., Hygenic Dairy Company, Casula, Liverpool ...	94	19 ,, 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	7[illegible]	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 ,, 1928
Department of Education, Hurlstone Agricultural High School .	33	10 ,, 1928
Department of Education, Eastwood Home	16	16 ,, 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 ,, 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 ,, 1928
Lunacy Department, Callan Park Mental Hospital	20	26 ,, 1928
Miss Brennan, Arrankamp, Bowral	24	29 ,, 1928
Department of Education, Yanco Agricultural High School .	34	12 Jan., 1929
H. Doggrell, Leicester Park, Mittagong	63	6 ,, 1929

—MAX HENRY, Chief Veterinary Surgeon.

Cold Storage of Potatoes.

A. J. PINN, H.D.A., Special Agricultural Instructor.

UNDER ordinary conditions of storage on the farm or in agents' stores, potatoes of the main crop quickly deteriorate with the advent of spring weather. Even in the coldest portions of the State deterioration and loss of weight are apparent after August, and by November the tubers are much sprouted and shrivelled, and are consequently of poor quality for table purposes. During the months of November and December the early coastal crops are expected to supply market requirements, and it frequently happens that high prices rule at that period of the year.

In view of the success of cold storage of other perishable commodities, it was thought that cold storage might also help largely in improving the marketing of main crop potatoes, more particularly in years of high yields, by enabling a proportion to be carried over to the usually high-priced period of November and December.

Experiments had previously been carried out by the Department, and had resulted in the potatoes coming out of store in an apparently satisfactory condition, but it was found in these cases that the tubers quickly collapsed after removal from storage. When cut, the tubers were found to have developed black patches within the flesh—a condition usually found in potatoes which have been subjected to a very low temperature. In the particular case under notice the potatoes were despatched to warm inland conditions immediately after removal from cold store, and the too sudden change may have been largely responsible for the break-down of tissue within the tubers. Some doubt also existed as to whether the temperature within the cold store of the company was uniform throughout the experiment, and for this reason it was advisable that further investigations be undertaken. With the increase of cold storage facilities in country districts, such as those now operated by fruit growers at Batlow and Orange, and also in view of the proposed establishment of cold stores by fruit growers in other potato-growing districts, it was felt that information could be obtained from a further series of experiments that would not fail to prove valuable.

The question of cold storage was discussed by the present writer at Llangothlin in July last with Mr. J. S. Whan, who, during the previous year, had forwarded a small case of potatoes for cold storage with satisfactory results. Mr. Whan undertook to arrange for the supply of a number of varieties of potatoes from district growers for an experiment, and Mr. Breden, Comptroller of Assets, Sydney Municipal Council, consented to co-operate with the Department, and kindly provided cold storage accommodation without charge.

The consignment of potatoes accordingly arrived in Sydney on 17th August, and was immediately weighed, branded, and placed in cold store. The arrangement of the consignment within the stores, as also the temperatures and later weighings, are readily seen from the following table:—

TABLE I.

Bag No	Variety.	Grower.	Room No.	Temperature o store-room.	Weight on arrival 17-8-27	Weight on 3-11-27	Percentage of loss on 3-11-27	Weight on 30-11-27	Percentage of loss on 30-11-27
				deg. Fah.	lb.	lb.			
A1	Factor	J. S. Whan .	14	38	153	148	Returned to owner.		
A2	Factor	"			155	147	4·4	145¼	5·1
A3	Factor	"			151	146		145	
A4	*Surprise.. ...	" ...			155	...	.	.	..
A5	Early Manhattan	O'Grady and Finn ...			155	146	6·1	144	7·1
A6	Guyra Blue (Coronation).	B. Betts			156	148	5·4	145¼	6·8
B1	Factor .. .	J. S. Whan . .	18	36	155	151	2 7	151	2·8
B2	Factor	" . ..			156	151		151	
B3	Factor	"			148	144½		144	
B4	*Surprise ...	" . .			150	.	..		.
B5	Early Manhattan	T. Handebo .. .			142	136½	3 8	134¾	5 1
B6	Brownell .	" .. .			142	136½	3·8	136	4 2
C1	Factor	J. S. Whan .	29	40	153	149½	2 6	148½	2 9
C2	Factor	"			155	150½		150½	
C3	Satisfaction ..	T. Handebo			141	138	2 1	137½	2 4
C4	Dakota Red .	" . ..			138	131½	4 7	130	5 7
C5	Brownell's Beauty	O'Grady and Finn			148	142½	3 7	142	4
C6	Guyra Blue (Coronation)	B Betts			151	148¾	3 4	147	4 5

* A bad keeper. Removed from store after six weeks.

The variety Surprise, which, under ordinary conditions of storage, is not usually a good keeper, was closely watched and was found to possess the same poor keeping qualities in cold store. It was deemed advisable to dispose of the two bags six weeks after the experiment began.

It will be noted that the variety Factor was stored in each room, and this variety, therefore, affords a basis for comparison of the loss occasioned under the conditions which existed in the separate stores. It is remarkable that the loss in weight of Factor at the first weighing was the lowest in the store in which the temperature was highest, while in the store of the lowest temperature the loss was but slightly greater. During the latter period of storage the loss in the store of lowest temperature was almost negligible.

TABLE II.

Store.	Original weight.	Total loss of weight.	Temperature.	Average loss, all varieties, final weighing	Remarks.
	lb.	lb.	deg. Fah.	per cent.	
No. 14 ...	617	37½	38	6	Not including one bag Factor and Surprise withdrawn before 30th Nov., 1927.
No. 18 ...	743	26¼	36	3·5	Not including one bag of Surprise withdrawn before 30th Nov., 1927.
No. 29 ...	889	33½	40	3·7	

Total all stores—2,249 lb., lost 97¼ lb. — average loss of 4·3 per cent.

It will be seen on reference to Table II that the percentage of loss in the store kept at a temperature of 36 degrees Fah. was the lowest, and in view of the fact that the potatoes came out of all stores in excellent condition it would appear that the conditions which existed in this store are the most satisfactory for storage.

The potatoes (other than Surprise, which was withdrawn early in the experiment) were sold on 7th December, the prices realised per bag being as follows:—Factor, 5s.; E. Manhattan (O'Grady and Finn), 6s.; Brownell's Beauty (O'Grady and Finn), 6s.; Guyra Blue, 7s.; E. Manhattan (Handebo), 7s.; Satisfaction, 8s.; Dakota Red, 7s.; Brownell's Beauty (Handebo), 8s. The two bags of Surprise withdrawn from cold store on 30th November were sold at 8s. per bag.

The prices realised are disappointing, but they do not reflect on the quality of the tubers after removal from cold storage. It will be remembered that this year the market has been glutted with new potatoes, and old-season tubers not cold stored were practically unsaleable when the experiment lot was sold.

One bag of Factor was returned to Mr. Whan at Llangothlin on 16th November, in order to test whether cold storage has any beneficial effect on seed potatoes. These potatoes have been planted alongside some of the same stock which had been kept on the farm in the ordinary manner. Mr. Whan did not receive these potatoes until three weeks after their removal from cold store, and his report on their condition on 10th December is, therefore, very interesting in further confirmation of the good quality of the tubers at the termination of the storage test.

Mr. Whan wrote: "I should unhesitatingly say that the bag of 'Factor' returned would be regarded as in excellent condition for seed requirements, having strong, short sprouts, about ½ inch long, this after three weeks' removal from cold store. They were planted in a space left alongside seed kept in the ordinary way, which, by the way, were much shrivelled and had very long sprouts which had to be broken off."

It would appear that, provided potatoes can be kept in a cold store where a uniform temperature can be assured and not removed immediately to excessively hot conditions, the quality of cold-stored tubers is quite satisfactory.

Although, so far as quality is concerned, cold storage of potatoes has proved satisfactory in this experiment, the question has still to be discussed whether the extra cost incurred will permit of a reasonable return commensurate with the risk. So far no charge is prescribed for potatoes in sacks, but the Sydney charge would probably be in the vicinity of 6d. per bag on going into cold store, and 2d. per bag each week. At this rate the cost per ton of potatoes stored for about eleven weeks would be 35s., and for eight weeks 27s. 6d. Usually potatoes would not be placed in store before August (and possibly September), and they might be removed for sale under normal conditions any time during November or December. To carry such a charge as the above, three conditions would appear to be essential.


SOLERO SHERRY, nutty and extra dry, offers an ideal drink and tonic which is deservedly popular with athletes in heavy training, and with keen followers of every sport. The tired brain worker turns naturally to this choice South Australian wine.
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First, the potatoes would have to be secured at a low price, such as occasionally rules during periods of glut when prices recede to £5 or less per ton. Second, it would be necessary to secure in August or September potatoes that have not been roughly handled, and that are in good, sound condition. Third, the weather conditions would require to be considered in so far as they are likely to affect the yields of the early crops on the coast.

Mr. W. J. Williams, manager of the Sydney Municipal Cold Stores, has been good enough to supply the appended report on the experiments in the cold storage of potatoes, carried out by him, including the experiment referred to in this report.

COMMENTS ON THE EXPERIMENTS.

WILLIS J. WILLIAMS, F.C.S., Manager, Sydney Municipal Cold Stores.

The cold storage of potatoes has for some time been the object of experiments carried out at our cold storage works in Sydney. The results of those experiments, together with valuable information on the subject from America, lead us to believe that the potato industry is on the verge of a new era which will ensure great benefits to the grower, dealer, and consumer.

Dry or common storage has been the only means of keeping the potato for any length of time, but the average loss by shrinkage under that method caused by uneven and generally excessive humidity is approximately 15 per cent. over a period of about twelve weeks. To this loss must be added the danger of infection by potato moth and fusarium fungus, which cause drastic results in dry stored potatoes, even though only a very few of the tubers may have been originally affected. Early experiments were carried out with a degree of success in combating the potato moth by fumigating periodically with carbon bisulphide, but the deterioration of the produce was instrumental in turning the thoughts and activities of those interested to cold storage.

My first experiment was commenced in October, 1926, by placing a quantity of potatoes in three cool rooms at temperatures of 32 deg., 34 deg., and 36 deg. Fah., respectively. These were packed in boxes and carefully picked over to ensure them being free from moth, fungus, or blemish of any kind. The tubers were left in store until 19th January, 1927, or a total period of fifteen weeks. Many tests were made. Those stored at the lowest temperature (32 deg.) were found to have lost about 6 per cent. in weight, but the appearance was good. The tubers had not sprouted, nor was there any decay. On being cooked and eaten, however, there was a decided sweetness, occasioned by the low temperature converting the starch in the potatoes into sugar. It is interesting to note here that after being kept for a few days the balance of this lot was eaten, and no trace of sweetness was found.

The potatoes stored at 34 deg. were found to have shrunk about 4 per cent. in weight, and the appearance was slightly better than those stored at the lower temperature, while the sweetness was not so decided.

With reference to those stored at 36 deg., the results were particularly satisfactory, the loss of weight being only 3 per cent., and the appearance all that could be desired, especially when it is taken into consideration that a large part of them were old potatoes. These potatoes retained their edible qualities and a good white colour.

The sap of the potato freezes at a lower temperature than water, the freezing point having been determined at 29 deg. Fah., and it is found that, after being frozen, a cut potato develops a pinkish tint after being out of store for a couple of hours. This changes to reddish, then brown, and finally turns quite black after about eight hours' exposure to the air. Care must, therefore, always be taken in the regulation of the temperature of the room where potatoes are cool-stored.

The next experiment was to cool-store tubers packed in bags, and thus to test them from a commercial aspect in accordance with the usual method of handling in this country. The object also was to experiment with several of the best known varieties of tubers with a view to ascertaining the particular varieties which can be stored with the most beneficial results.

Accordingly on 17th August last I took delivery from the Department of Agriculture of eighteen bags of potatoes, all carefully examined and found to be in good order and condition, including the following varieties:—Factor, Surprise, Manhattan, Guyra Blue, Brownell, Satisfaction, and Dakota Red. Each bag was carefully weighed. The experiment was again divided into three parts, the temperatures on this occasion being 36, 38, and 40 deg. Fah., respectively. Inspections were made from time to time, and at the end of six weeks it was found that the Surprise variety could not with safety be kept any longer. It is a soft variety of potato, and the loss of weight, even over that comparatively short period was about 6 per cent. The appearance was unsatisfactory, and the tubers were soft, although they had not sprouted. I would definitely state now that this variety of tuber is not suitable for cold storage.

After the balance of the consignment had been left in store for a total period of fifteen weeks, they were re-weighed. Those stored at 40 deg. Fah. were first weighed, and from an original weight of 889 lb., they had decreased to 855½ lb., representing a total loss of 33½ lb., or 3.7 per cent., the least shrinkage being on the Satisfaction variety, which decreased only 2.4 per cent.

Of those stored at 38 deg., the total weight of 617 lb. was 37½ lb. short of the original weighing, or 6 per cent. loss.

The best results of all were obtained from the tubers taken from the room at 36 deg., the weight of these having only declined 3.5 per cent., represented by a loss of 26¼ lb. on a total of 743 lb. In this room the shrinkage of the Factor variety was exceptionally small, a total weight of 459 lb. losing only 2.8 per cent. in store. The average loss on the whole experiment was approximately 4 per cent.

It must be clearly understood that where there has been the greatest loss in weight, the cause, no doubt, was that the humidity was low, whereas the potatoes that had the least loss in weight were those in the room with the higher humidity.

The humidity will, therefore, at all times have to be considered in connection with the storage of potatoes, too much humidity resulting in moulds. The testing of this part of the experiment will be the special care of those who conduct the experiments when the next lot of tubers is placed in store.

Excellent results were obtained from the Factor variety in all temperatures. It was noticeable that the Manhattan variety kept very well under 36 deg. for the first eleven weeks, but after that was inclined to lose weight much quicker. Taking the experiment all round the results of the weighing test were quite satisfactory in all varieties, with the exception of Surprise, which, as before mentioned, did not store well.

All the tubers were found to be quite firm after coming out of store. They had retained an excellent appearance, and there was no sign of sprouting or decay. On being cut a good white colour was found in all cases. Edibility had not been marred in the slightest, and no sweetness was present, except a slight amount in the temperature of 32 deg. These potatoes, after being removed from store, were forwarded to the vegetable markets for sale. The prices received were good, and the salesmen commented very favourably on the appearance, quality, and general selling qualities of the produce.

By this experiment, which was on a much larger scale than previously, it is confirmed that, stored at a temperature of 36 deg. Fah. for a period of fifteen to sixteen weeks, the loss in weight ranges only from 4 to 5 per cent. This loss of weight represents about 90 to 112 lb. on a ton of potatoes, against the loss in common storage of approximately 336 lb. or 3 cwt.

These experiments dealt only with perfectly sound and disease-free tubers, and naturally it would be essential to exercise care in selecting tubers un-bruised and unaffected by moth or fusarium fungus, but it is interesting to note the results of another experiment carried out in treating by cold storage potatoes in various stages of infection by these pests.

The purpose of the experiment was to ascertain what destroying or checking effect the reduction of temperature would have. These tubers were placed in a room having an average temperature of 39 deg. The first examination was made in forty days, when it was found that, though living larvae and pupae were present, the caterpillars had become torpid and had ceased feeding, which proved that the lower temperature had the effect of inhibiting the work of the potato moth. A checking was also noticed in regard to the fungus. An examination after about two months' storage showed that the cold had caused all the larvae to leave the tubers, and further periodical inspections, after about seventeen weeks, disclosed that there were no living forms of the potato moth, all stages being totally destroyed.

It is, however, advisable that more care should be taken in the digging and handling of this produce than is generally the case. Unfortunately there is a tendency to think that potatoes can be bruised and roughly

handled without their keeping qualities being injured. It should be emphasised that equal care should be taken with potatoes as with apples or any other produce.

From the result of all the foregoing tests, we realise the distinct advantages of cold storage for potatoes. Apart from the added marketable value of the produce in comparison with common stored potatoes, it is of considerable benefit to the grower that tubers do not sprout in cool storage, and thus seed potatoes can be preserved until such time as they are required for planting.

There is no difficulty in storing local tubers, and providing the produce is in good condition, free from disease, and that the conditions of the cold store are complied with, there is no reason why the method of keeping by cold storage should not be used in preference to common storage, and become a universal aid to producer, merchant, and consumer.

The Better Farming Train.

Arrangements are now being made for further tours of the Better Farming Train, which last year proved so popular in the districts which it was able to visit. To meet the convenience of producers, it is not considered advisable to send the train to the main western and south-western areas until wheat-sowing operations have been completed, and the first itinerary this year will include the Northern Tablelands.

According to present arrangements, the movements of the Better Farming Train during March will be as follows:—

March 6—Tamworth.	March 14—Glen Innes.
„ 7—Tamworth.	„ 15—Tenterfield.
„ 8—Walcha Road.	„ 16—Tenterfield.
„ 9—Uralla.	„ 17—Ben Lomond.
„ 10—Armidale.	„ 19—Manilla.
„ 12—Guyra.	„ 20—Barraba.
„ 13—Glen Innes.	

At each stopping place an intensive programme of demonstrations and lectures will be carried out, commencing about 10 a.m. and continuing throughout the day. The various sections of the train will be open for inspection from 10 a.m. until 9 p.m. continuously, and visitors will find much to help and interest them while demonstrations are in progress with which they may not be individually concerned. Everyone within reach of the stopping places should spend the whole day at the train, and not miss any feature of the programme. Hot water is freely provided for those who desire to lunch at the train.

Growers of pineapples in Hawaii have suffered in recent years by the fruits falling off in flavour on some of the plantations. Scientific examination led to the belief that the cause was a deficiency of manganese; additions of manganese salts were therefore made, and the trouble is said to have been in great part remedied.

The Green Peach Aphid.

Myzus persicae (SULZER).

E. H. ZECK, Assistant Entomologist.

THE green peach aphid is of world-wide distribution, and has a most extensive range of secondary food plants. This great range of food plants, combined with structural variations in the different generations, led in the past to it being described under many different names.

In New South Wales the first recorded outbreak of green peach aphids appears to have occurred in 1910, in the Glen Innes district, [1] but doubtless it was present in the State some years before that. It has never become a serious pest in New South Wales, except that in some years it has caused considerable damage on peach trees in the Murrumbidgee Irrigation Areas.

Economic Importance.

The most serious damage is caused to the trees just when the delicate fruit and flower buds are opening out in the spring. The aphids then swarm over the buds and leaves, sucking up the sap, retarding the development of the twigs and fruit. The leaves soon become curled and distorted, and thus form admirable shelter for the aphids to feed beneath, and also rendering it difficult to reach them with sprays. (See Fig. 10 on page 150.) It may be remarked that some aphids are able to transfer virus diseases from one plant to another [2].

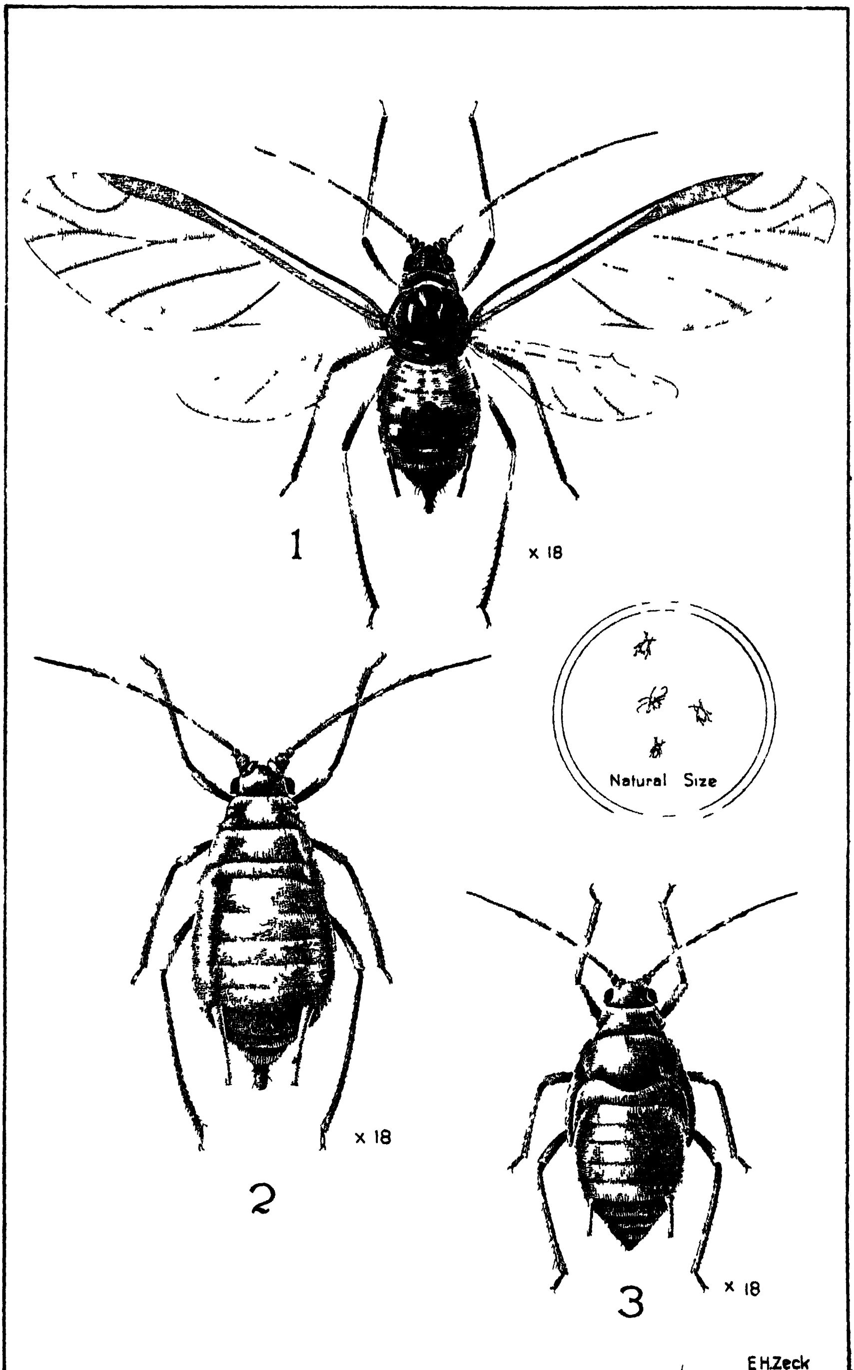
In other parts of the world this aphid is also known as the "spinach aphid" and "potato aphid," and causes serious damage in those crops during the summer months. The green peach aphid has been recorded as one of the most injurious insect pests in the island of Formosa [10], and as a serious pest of sprouting potatoes and of cauliflower in North Wales [12].

Life Cycle.

Typically the life cycle is as follows:—The wingless females which develop from the overwintering eggs upon the primary host plant (the peach) are known as "stem mothers," because they are the founders of the colonies which carry on the life cycle throughout the year.

The "stem mothers" (first generation) give birth to young viviparously, and these develop into viviparous wingless females (second generation), which then give birth to young nymphs which develop into winged females (third generation).

These winged females constitute the generation known as "spring migrants," which fly off to numerous secondary host plants, where they reproduce viviparously winged or wingless females. Several generations develop in this manner upon these food plants, until certain winged viviparous females known as "autumn migrants" are developed.



The Green Peach Aphid (*Myzus persicae*).

Fig. 1.—Winged viviparous female (spring form), x 18. Fig. 2.—Wingless viviparous female, x 18.
Fig. 3.—Nymph of winged viviparous female, x 18.

These females then fly back to the peach tree where they give birth to the larvae which develop into wingless egg-laying females. Meanwhile, male nymphs have been undergoing their development upon the secondary host plants, and these, having reached their winged stage, fly off to the peach trees, where they mate with the egg-laying females. The eggs, which are known as the over-wintering eggs, are laid on the twigs, and may be seen with the naked eye.

It is only during the late autumn or early winter that these true sexual males and females are developed. Throughout the remainder of the year reproduction takes place parthenogenetically, each female giving birth to living young, all of which develop into winged or wingless viviparous females. This life cycle is represented in graph form on page 152.

The green peach aphid (*Myzus persicae*) should not be confused with the black peach aphid (*Anuraphis persicae-niger*), which is much more common in New South Wales, which normally overwinters upon the roots of peach, and is rarely found upon any other host.

Huckett states ([7]) that *Myzus persicae* "overwinters on Long Island in the egg and nymphal stages on cruciferous crops that are capable of surviving the winter," also "that in the spring and early summer most winged forms migrate from their temporary host plants to the vast areas of potatoes, where the aphids breed and multiply until the potatoes commence to blossom. With the disappearance of the blossoms there commences a general exodus of the winged migrants from potato to any other form of vegetation."

In another part of America the green peach aphid passes the winter in small colonies upon other species of prunus ([4]). Gillette ([5]) records the peach and plum as the chief autumn, winter, and spring hosts, although a considerable proportion of the autumn aphids remain viviparous and hibernate on various herbaceous plants out of doors and upon various greenhouse plants. In France they have been recorded upon peach during spring and autumn, in summer upon potato, wild solanaceous and other plants, during winter in vegetable gardens.

From the data so far collected it seems evident that, in the warmer districts of New South Wales, the overwintering egg stage plays a much less important part than it would in the colder districts. Eggs have been observed upon the peach trees at Griffith and Leeton, in the Murrumbidgee Irrigation Area, and will probably be found to occur in most of our colder localities. The eggs are about 0.6 mm. in length, and when first laid are greenish, but within two or three da[illegible] they become shining black.

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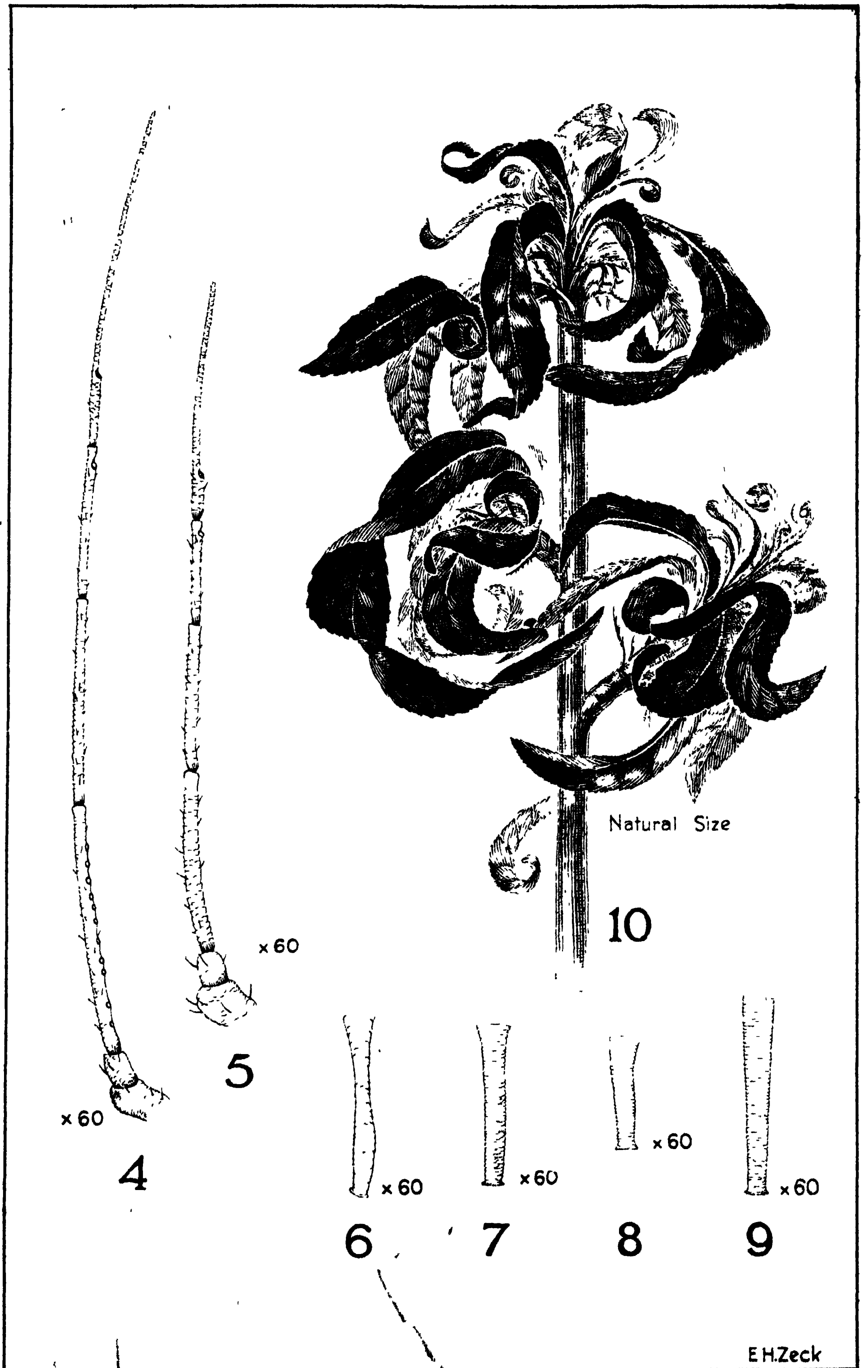
Food Plants ir[illegible] Wales.

row

The food plants of this aphid wi[illegible] [illegible]n Wales are (primary host) the peach, (secondary hosts) 75 [illegible] (*Cryptostemma calendulaceum*), dock, dahlia, Iceland poppies, [illegible] [illegible]oses, spinach, sow thistle (*Sonchus*



The Green Peach Aphid (*Myzus persicae*).

Fig. 4.—Right antenna of winged viviparous female, x 60; Fig. 5.—Right antenna of wingless viviparous female, x 60; Fig. 6.—Left cornicle of winged viviparous female (summer form), x 60; Fig. 7.—Left cornicle of winged viviparous female (spring form). x 60; Figs. 8 and 9.—Left cornicles of wingless viviparous females to show variation in size, x 60; Fig. 10.—Young peach leaves showing the characteristic curling and distortion caused by the aphids feeding on the under surfaces.

oleraceus), tomatoes, trumpet flower (*Datura strumarium*). A spinach plant, heavily infested with these aphids, was observed at Ryde, New South Wales, during June, 1927, and when examined about two weeks later it was found that the entire colonies had been killed by a parasitic fungus.

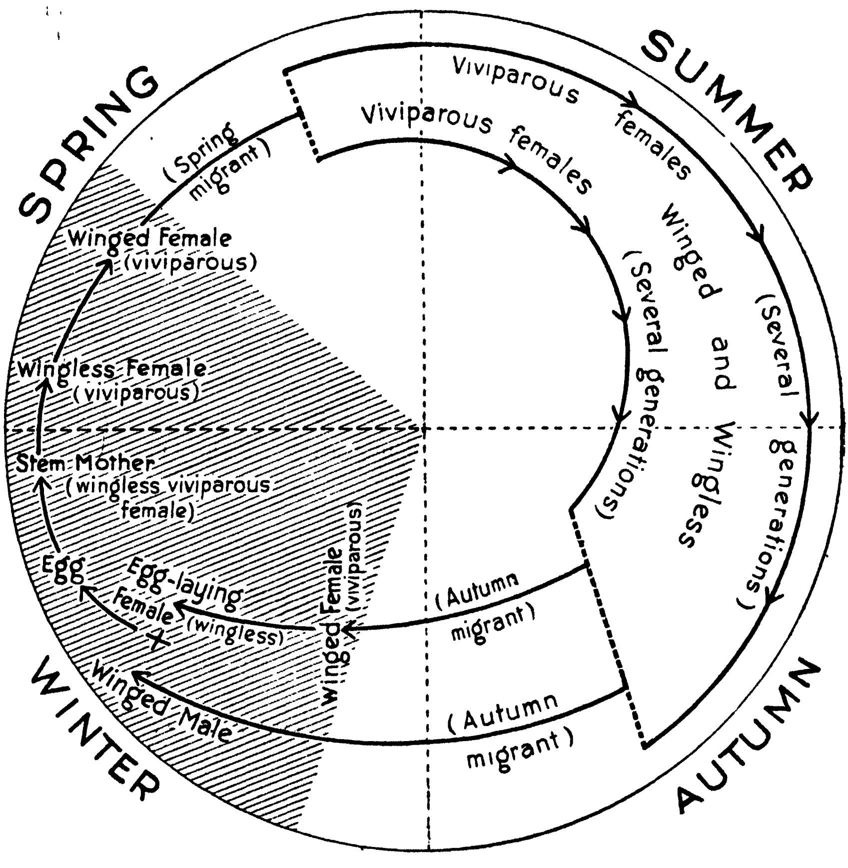
Description of the Green Peach Aphid.

The apterous (wingless) viviparous female is figured in Fig. 2 on page 148, and in Figs. 5, 8, and 9 on page 150, the specimens being from peach leaves, collected at Griffith, New South Wales, October, 1926 (W. B. Gurney). The general body colour is pale green or yellowish-green, the spring forms having three more or less indistinct dorsal longitudinal green stripes. In the summer forms, occurring upon secondary food plants, these stripes are usually wanting. The surface of the body is finely reticulated, and with few hairs; eyes, dark red; length of body, 2.3 mm.; at greatest width, 1.1 mm.; antennae, 1.65 mm.; segments: I-0.1, II-0.08, III-0.39. IV-0.32, V-0.23, VI-0.53 (0.1 + 0.43) mm.; antennal tubercles prominent, converging, gibbous; first segment of antenna gibbous. One small sensoria on distal portion of V; usual small cluster at base of spur on VI; imbricated and with few scattered hairs. Cornicles usually cylindrical, tapering, but sometimes slightly dilated; imbricated; usually pale green, but sometimes slightly darker at distal extremities; length, 0.44 mm. (in some individuals much shorter). Hind tibiae, 1.15 mm.

The winged viviparous female (the spring migrant) is shown in Fig. 1 on page 148, and in Figs. 4 and 7 on page 150. The specimens were from peach leaves collected at Griffith, New South Wales, October, 1926 (W.B. Gurney). The head is a light brown; eyes, dark red; prothorax, light brown; mesothorax, light brown, amber or greenish; the scutum, parapsides, scutellum and median part of mesosternum dark brown to almost black; metathorax brown or greenish; metanotum with median dark brown or black spot. Abdomen, ground colour green (much darker than apterous females). Upon the dorsum of the abdomen there is a large dark brown or greenish patch of colour extending over segments 3 to 6, and continuing on in broken patches of colour over segments 7 and 8; each segment with a small spot of similar colour along the dorsolateral margin; smaller scattered spots upon the dorsum of segments 1, 2, and 3. In some examples the markings upon the abdomen are but little darker than the general ground colour. Legs, pale green; femora and tibiae with distal portions dusky or dark brown; tarsi dark; cauda usually light. Length of body, 2 mm., at greatest width 0.73 mm.; antennae brown, third segment palest, darkest at distal extremity, imbricated and with few scattered hairs, tubercles prominent, converging; antennal length, 2.24 mm.; segments, I-0.1, II-0.07, III-0.55, IV-0.45, V-0.33, VI-0.74 (0.16 + 0.58) mm. III with usually eleven circular sensoria in a row; sometimes ten to thirteen. V with one sensoria on distal portion. VI with usual small cluster at base of spur. Length of wing (anterior), 2.75 mm.; expansion 6 mm.; wings finely

imbricated, veins brown, stigma light brown or grey. Cornicles dark, smoky, or blackish, imbricated, cylindrical, tapering; length, 0.33 mm.

The winged viviparous female (autumn migrant) is drawn as Fig. 6 on page 150. The autumn migrant is lighter in colour than the spring migrant, and the markings are not so pronounced, but the most outstanding difference is in the form of the cornicles which in the autumn migrant are distinctly clavate. Some of these autumn migrants are distinctly red in colour, while others vary from light yellow to greenish-grey.



Life Cycle of the Green Peach Aphid (*Myzus persicae*).

The shaded sector represents that portion of the life cycle which is passed upon the primary host plant (the peach). The remainder of the life cycle is passed upon secondary host plants (vegetables, ornamental garden flowers or shrubs, weeds, etc.)

The nymph of the winged viviparous female (Fig. 3, on page 148) has the same general ground colour as in the apterous (wingless) viviparous female; the surface of body is finely reticulated, and with a few hairs; eyes,

dark red; wing sheaths and head pale yellowish; spring form with three more or less distinct dorsal longitudinal green stripes; body length, 2 mm.; at greatest width, 0.93 mm.; antennae, 1.07 mm.; segments, I-0.08, II-0.07, III-0.29, IV-0.2, V-0.16, VI-0.45 (0.09 + 0.36) mm.; pale green, imbricated, distal half somewhat darker. Cornicle pale green, length 0.26 mm.; cauda pale green.

As specimens of the egg-laying females and males were not available for description and inclusion in this paper at time of writing, the following description of these forms has been abstracted and slightly modified from the paper by Gillette (4):—

In the oviparous female (the wingless egg-laying female), the antenna is about two-thirds as long as the body, or approximately 1.45 mm.; no sensoria were observed upon III of antennae; length of body, 1.70 to 2 mm.; cornicles 0.33 mm.; about 25 small circular sensoria occur upon each hind tibia.

The male (winged) has colours practically the same as in the spring migrant, but with the black or blackish markings (at least in some specimens) more extensive; antenna, 2.30 mm.; III-0.56, IV-0.49, V-0.40, VI-0.74 (0.14 + 0.60) mm.; numerous small circular, moderately tuberculate sensoria upon segments III, IV, and V. Cornicles dusky to black, moderately swollen, as in the autumn migrating female. Lengths: Body, 1.85 mm.; wing, 3.20 mm.; cornicles, 0.34 mm.

Control.

As stated above, the green peach aphids also exist upon other plants than the peach in the warmer districts of the State during the winter months, and they may continue their development on such plants, so that clean cultivation is a factor in control.

In the late winter or early spring (not later than when the buds begin to swell) the trees should be sprayed with a mixture consisting of 1 gallon miscible red oil to 20 gallons of water, to which an adequate quantity of washing soda may be added when required to produce a thorough emulsion.

Tobacco or nicotine washes will kill the green peach aphids, but if the tree has become so heavily infested that the leaves curl and twist, it becomes difficult to reach numbers of the sheltering aphids with the spray. This indicates the importance of watching the trees carefully, and if over-wintering eggs are found, they should be sprayed with the miscible red oil in the late winter or early spring.

During the summer tobacco wash, made at the strength of 25 lb. stalk or waste tobacco to 72 gallons of water, or nicotine sulphate, 1 pint to 100 gallons, or even nicotine dust is used. Not more than one application may be necessary if it is an early and thorough one. In using these summer sprays an important factor is to hold the nozzle fairly close to the foliage

and to use a strong pressure, and a somewhat coarse spray. If this is done, and if care is taken to apply the spray thoroughly and generously to all parts of the foliage, the pest will be controlled.

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INFECTIOUS DISEASES REPORTED IN DECEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of December, 1927:—

Anthrax ...	2
Pleuro-pneumonia contagiosa ...	4
Piroplasmosis (tick fever) ...	Nil.
Blackleg ...	1
Swine fever ...	4

—MAX HENRY, Chief Veterinary Surgeon

THE SCOPE OF AGRICULTURAL RESEARCH.

POPULAR conceptions of research are sometimes apt to be rigidly linked to pictures of painstaking work with test tubes, microscopes, caged animals, and a variety of other indoor objects. But research in the applied sciences, though often originating in small scale studies, must soon escape these confines. Agricultural science, in particular, must have the freedom of flocks and herds, of fields, farms, and even countrysides. It must attend, moreover, to practical farming needs and to considerations of profit and loss. In consequence there arises, in connection with agricultural science, a wide and important, more or less routine, branch of activity. To this is entrusted the practical utilisation of what pure and applied science teaches, as well as the task of helping to find out in what matters industry particularly needs the help of science.—F. L. ENGLEDOW in "Agricultural Research in 1926."

Rock Melon Culture.

J. DOUGLASS, H.D.A., Agricultural Instructor.

It is only during the last few years that consumers and growers have given this crop any special attention. The increasing popularity of the rock-melon is, to a large extent, due to the degeneration of the water melon, and to the increased demand for high-quality rock melons by high-class fruit and sundae shops. The public of to-day are being quickly educated as to quality, and are beginning to ask for certain well-known varieties by name.

The city market a few years ago depended almost entirely on the large growers from the rich alluvial coastal flats. To-day a good number are still supplied from these areas during the main crop season, but good quality melons also come from other districts. The small growers in the metropolitan area and in the Erina Shire have made a study of the early crop, and are able to place the fruit at the correct stage of maturity on the early market. Growers on the river flats on the western slopes and irrigation areas, which districts are comparatively free from disease, specialise in the late crops, growing the winter-keeping melons.

Soil Requirements.

Rock melons require a favourable season for production of maximum quality and quantity of fruit. The crop is readily affected by adverse seasonal conditions, over-irrigation, diseases, and other factors. Rich sandy or loamy soil, well-regulated soil moisture, abundance of heat and sunshine, with a dry atmosphere, are the perfect conditions under which to grow rock melons.

As the best prices are obtained for early melons, it follows that land that warms up early in the spring is the most suitable for the early rock melon crop. The soil along the coast and around Sydney is sandy, and when built up with organic and artificial manures, produces very profitable early crops. Under most circumstances, light loam, which is rich in organic matter, and well drained, is the best for rock melon production. In late districts heavier land can be used, providing attention is given to the drainage.

Rock melons can be produced on a limited scale over the whole of New South Wales. The plants are readily killed by frost; hence it is necessary to have a growing period free from frosts. Practically all districts in New South Wales possess this requirement, except occasional seasons on the Tablelands. The most suitable climatic conditions are found in districts with a long frost-free growing period, comparatively dry atmosphere, with hot days and warm nights.

Cultivation of the Crop.

As the rock melon thrives under good conditions, it is essential to have the soil in the best order. The early ploughing should be carried out in late autumn or winter, and the soil then allowed to lie in the rough. The

preparation of the seed bed varies with the local conditions, type of soil, &c. When the seed bed is finally prepared, attention should be given to soil drainage. In districts where the soil is light and elevated, a system of drains can be constructed that will quickly carry off surface water and prevent soil erosion. In flat country furrows should be ploughed at convenient distances to take off the excess moisture. The soil from the drains should in all cases be used to build up the surface of the bed. If the crop is to be irrigated the furrows should be ploughed before planting the seed.

Sowing.

The time of planting varies in the different districts. In the earliest localities on the coast the seed can be planted as early as August, while on the tablelands planting cannot be carried out before late October. The prevailing weather conditions largely control the date of planting. If the weather is fine and warm, planting is carried out as early as possible; on the other hand, if the weather is cold and wet, no advantage is gained by planting as the seed will rot or give a slow germination. The actual number of seeds planted in each hill depends on the moisture content of the soil, time of planting, and quality of seed. As the soil temperature gradually improves after seeding commences, it is found that a quicker and better germination is obtained late in the season; hence fewer seeds are planted as the season advances. It is a good practice to seed heavily as the plants can always be thinned out, the proper time for that operation being when the plants begin to put out their true leaves. A good method to follow is to thin out to five plants in each hill in one operation, and later thin out to two or three plants. The object of having the final thinning out as late as possible is in case insects or disease destroy certain plants, leaving too few in each hill.

Rate of Seeding.

The amount of seed required to sow an acre depends on (1) spacing of hills, (2) quality of seed, (3) condition of land at planting time, and (4) number of seeds planted in each hill. Generally speaking, about 1½ to 2 lb. of seed is required to plant an acre.

At present the majority of farmers depend on seedsmen for their seed supply. However, now that the market demands fruit having certain characteristics, growers are paying more attention to the home production and selection of seed. A crop produced from mixed seed contains a large percentage of melons not uniform in quality or size, and also many undesirable, unmarketable types. Many of the varieties grown at present have no outstanding market value, and only tend to increase the danger of mixing superior varieties by cross-pollination.

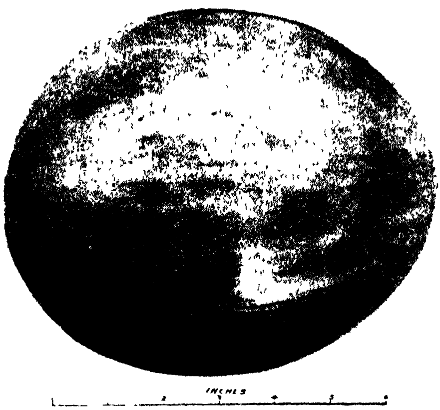
When selecting seed more attention should be given to the individual plant than the individual fruit. Select seed from plants bearing an average number of fruit, uniform in quality and size. Avoid plants that are light bearers, having only one outstanding fruit, or having fruit of undesirable size or quality.

Save Your Own Seed.

The growers that save their own seed sometimes have a good deal of trouble in separating it from the pulp, &c. The correct procedure is to allow the melon to ripen thoroughly on the vine, then cut it in halves and pour the juice, pulp, and seeds into a container. The liquid is allowed to ferment for three or four days; the fermentation removes the gelatinous coating on the seed and facilitates washing and cleaning. Any seed that floats should be poured off with the liquid. The seed is washed with clean water several times, drained, and then spread out in a thin layer to dry.

Intensive Culture.

In the metropolitan area the farms or gardens are small, hence the method of growing rock melons differs a good deal from those employed in other districts. Owing to the high land values, it is necessary to obtain as many crops as can be judiciously grown on the same land in the one year. Rapid rotations are carried out, and long fallows are unknown. In most gardens rock melons follow winter lettuce. The land must be specially manured for lettuce, and full use is made of this manure by following the lettuce crop with rock melons; the usual practice is to plant the seed of the rock melon in rows between the lettuce, thus at one period the two crops actually occupy the land at the same time. This method gives fair results, but much better are obtained by sacrificing a few lettuce, and planting the seed in hills 6 feet x 6 feet throughout the crop. By the time the lettuce are finished the vines are just beginning to run. Cultivation is then carried out, and as irrigation is commonly practised there is no danger of the soil moisture drying out.



Honey Dew.

In field practice the seed is planted in hills 6 feet x 6 feet. Some farmers practise throwing a few furrows together at intervals of 6 feet. This allows the hills to be readily made, ensures thorough drainage, and facilitates after cultivation. The disadvantage of this system lies in the rapid drying out of the soil. The hills in which the seed is to be planted are made by either working well-rotted organic manure into the soil or working up the soil with a hoe. If poultry manure is used it should be placed in the hills about ten days before planting to allow it to ferment. At planting time this manure is mixed with the soil after a little superphosphate has been added, and the seed planted. This mixture of poultry manure and superphosphate is the ideal fertiliser for rock melons.

The best method of planting the seed is roughly in a circle 1 foot in diameter, about ½ inch of soil should be slightly compressed around the seed and the top mulched with loose soil or rotted manure. Seed can be planted deeper if sown in the spring or summer, or if sown on soil of a very light nature.

Transplanting.

Transplanting as a mean of obtaining an early crop is not practised in this country, except in an experimental way. In early districts where the area of rock melons planted is small, however, this system has a lot to commend it. Clay pots, cardboard containers, or even jam tins with the bottom melted out, can be used with success. These containers, which are about 4 inches in diameter, are filled with a fine mixture of soil and leaf mould. The drainage is ensured by placing small stones or coke in the bottom. The seeds are sown in these containers about four to six weeks before the usual field planting time. These containers are placed in an ordinary hot frame and protected from the weather. About six seeds are planted in each container, being covered about ½ inch deep with fine mulch. The frame is given a thorough soaking at planting time, and under ordinary conditions it is not advisable to repeat the watering until the plants are well up. Great care should always be exercised with the watering, as the seedlings are readily drowned and overwatering encourages certain diseases. The soil should always be kept damp, but not wet. Field transplanting takes place when the outside conditions are suitable. After a suitable hill is prepared, the plant and soil is removed in one piece from the container, care being exercised to see that the roots are not disturbed or injured during the operation.

The chief advantages of planting a crop by this system lies in the fact that the seedlings are confined to a limited area, and that the early growing conditions are more or less under control. These conditions practically eliminate the possibility of faulty germination often experienced under unfavourable field conditions. Aphis and other serious insect pests are easily controlled, and more effective results are obtained from sprays, &c., owing to the limited area that has to be worked, while the atmospheric conditions can be controlled by covering the frames at night, &c. In countries where this system of growing rock melons is practised, growers contend that the saving in seed pays for any extra expense involved.

The after-cultivation of rock melons should be carried out very carefully, especially when the vines are beginning to run. The plants are comparatively shallow-rooted, and extend their roots over a large area. The tendency, therefore, is for these roots to become severed by careless cultivation. After a certain period it is found that the vines completely cover the ground, making further cultivation impossible.

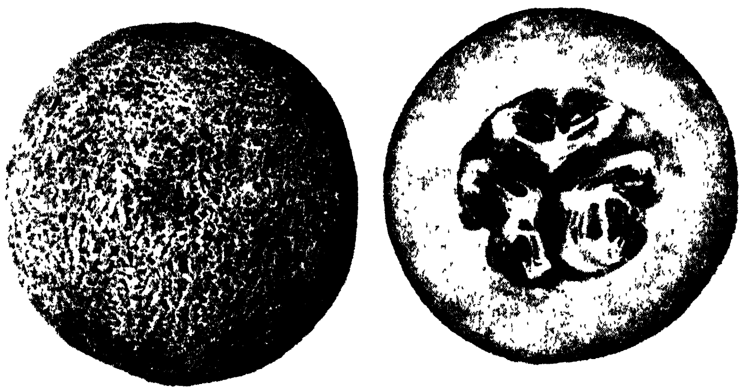
Pollination.

The cropping quality of the rock melon depends on the successful pollination of the flowers. This, to a large extent, depends on the work of bees, hence growers encourage the presence of these insects. The flowers of the

rock melon can be divided into two groups—(1) male, and (2) hermaphroditic flowers. The latter type contain both male and female organs, and can be self-pollinated. However, all hermaphroditic flowers do not set fruit, and much better results are obtained when bees are working in the crop. Rock melons readily cross-pollinate with different varieties. The resultant fruit of these crosses may not show variation, but the seeds from them will produce hybrid plants. Contrary to general belief, rock melons will not cross with water-melons, grammas, or pumpkins; hence they can be planted in close proximity to those crops without danger of the seed being inoculated.

Marketing.

In New South Wales, very little attention has been given to the correct method of marketing rock melons. This is largely due to our system of marketing, and also to the type of melons grown. However, as the varieties



Pollock 10-25.

and types are becoming better known, the public will demand more uniformity in the method of marketing. Growers who supply local shops, or who transport their produce right into the market can dispose of the crop by number. The country growers, however, must pack and forward to market in containers. Usually a bushel, or benzine case, is used, the fruit not being packed according to any recognised system.

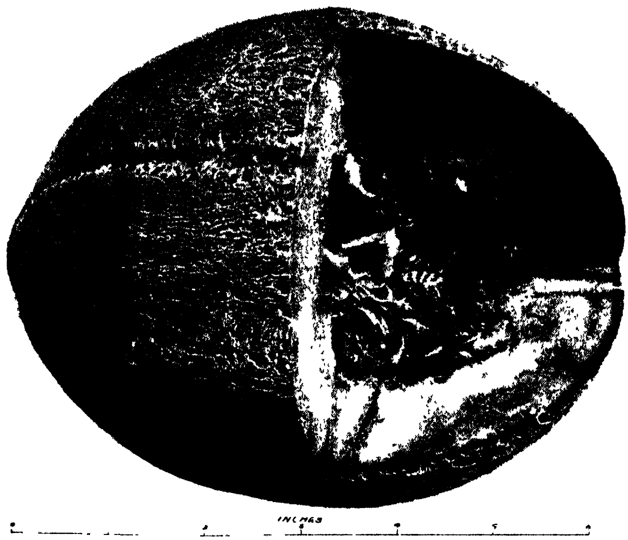
Apart from the fact that the size and quality of the majority of melons are not uniform, growers have no fixed method of judging the maturity of their crops. The result is that the majority of material arrives on the market either too green or over-mature. With a little experience and by following the points set out, a grower should soon be able to judge the right stage at which to harvest the crop. In some varieties the colour of the skin changes to various shades of yellow on approaching maturity, but in well-netted varieties this cannot be observed. The mature fruit can be readily slipped from the stem by pressing with the thumb. In a well-netted variety the netting becomes hard, and well developed, and with certain types the

netting cracks. By picking fruit too green a good deal of flavour, aroma, and general quality is sacrificed. The sugar content of the fruit does not increase after picking, although in some varieties the texture improves.

Varieties.

The true classification of the different groups of rock melons is now rather difficult owing to the number of cross-bred varieties. Generally speaking, there are three groups of melons: (1) Varieties with warted or furrowed fruit, (2) netted varieties, and (3) winter or long keeping melons.

In Europe the fruits in group (1) are called cantaloupes; while in America group (2) is known by the same name. Generally speaking, in the United States any melon with a musky aroma and flavour is known as a



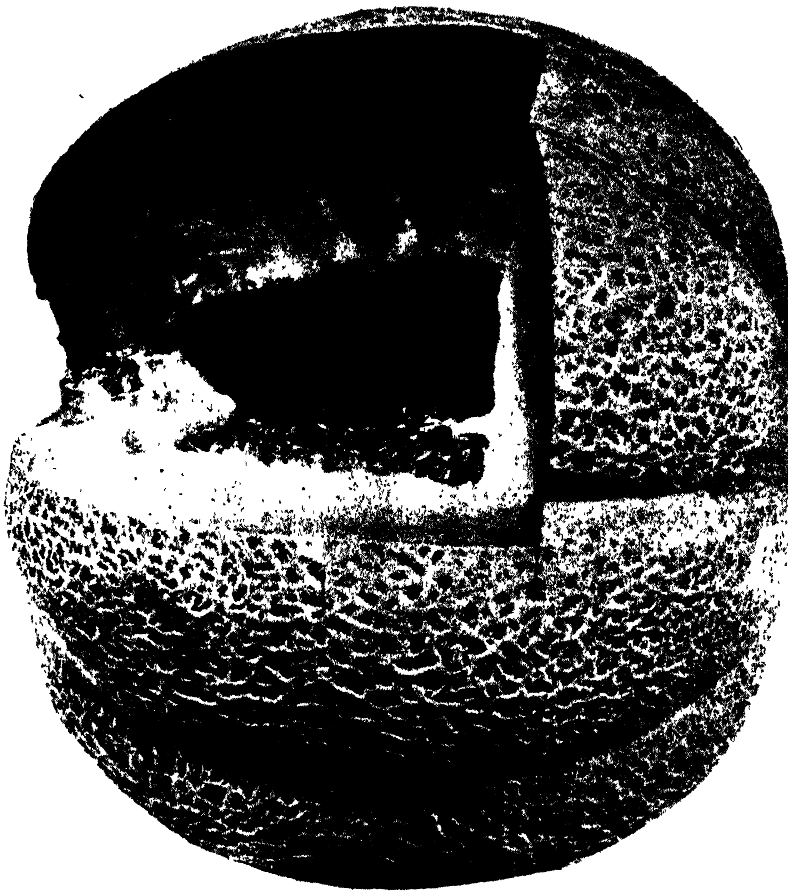
Burrell's Gem.

musk melon. In Australia all varieties are known as rock melons, although the classification of cantaloupes, or cassaba, is sometimes indiscriminately used to describe certain types. The winter-keeping melons are in many respects different from the other two groups. They are late maturing types, and are renowned for their keeping qualities; another distinguishing feature being that the whole of this group lack aroma.

The Department of Agriculture imported several varieties of rock melons last year with the object of testing and observing their behaviour under local conditions. The past season was one of the worst ever experienced by the growers, the result being that no actual figures of yields were obtained. Despite the season, however, a good deal of information was obtained concerning the several varieties under trial.

Honey Dew.—This variety is perhaps the best known of the new introductions. It has been grown commercially for the past few seasons, and is now firmly established as the most popular winter melon on the market.

Honey Dew originated in Europe where it was recognised as a winter variety. The shape of melons of this variety is oval, and the skin is smooth without ribs. The colour of the skin is greenish-white, changing to creamy yellow when ripe. The flesh is pale green in colour, exceptionally thick, fine grained, and has a characteristic sweet fresh flavour when ripe.



1 Inch

Early Hackensack.

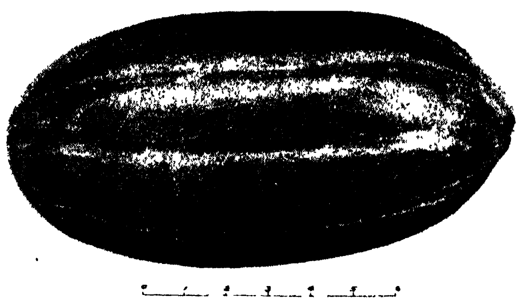
Some growers experience a good deal of difficulty in ascertaining when the melons are ripe, since this variety does not crack between the stalk and the stem like other types. The main features which denote the maturity of this melon are that the skin begins to lose its shiny appearance, and changes in colour to creamy white, and the blossom end begins to soften. This variety keeps exceptionally well and carries splendidly.

Pollock 10-25.—This variety has been on the market for a few seasons and has become very popular owing to its high quality and aroma. It is much sought after by the best sundae shops owing to its convenient size and shape. The fruit is small to medium in size, heavily netted, slightly oval, and is not ribbed. The flesh is salmon-tinted, deep, of high aroma and flavour, and devoid of fibre. This melon belongs to the Rocky Ford group, of which there are a great number of varieties. There is little difference in the varieties of this group, except that some are slightly netted. and the flesh varies in colour from yellow green to salmon. Generally speaking, these varieties carry well. Being very uniform in size, they can be readily and systematically packed in cases for market There are two or three other varieties very similar in their main characteristics to Pollock 10-25, all of which are featured in the city shop windows as "cantaloupes."

Nixon.

Heart of Gold.—This variety was tried out under Government supervision for the first time last season. The fruit is oval in shape, finely netted, and ribbed with very shallow grooves. The flesh is salmon-coloured, exceptionally thick, with the seed cavity distinctly triangular in cross-section. The texture of the flesh is fine, with a rich flavour and bouquet. Heart of Gold also belongs to the Rocky Ford group, and is an early maturer.

Burrell's Gem.—This variety has a distinctly oval shaped fruit, slightly ribbed, and only thinly covered with fine netting. In cross section the seed cavity is triangular in shape and small compared with the size of the melon. The flesh is fairly deep, light salmon in colour, of fine texture, with a fine odour and flavour. It is a mid-season variety.



Sugar.

Early Hackensack.—This variety is the most popular with the growers around Sydney or within a few miles of the best markets, and growers along the coast in the earliest localities have been growing it as a main crop for a number of years. Little attention has been given to the selection of seed, resulting in a gradual deterioration of quality, until at present the variety is very mixed. The true Early Hackensack fruit is fairly large, oblate, and distinctly ribbed, although the ribs are irregular in width. The netting is

coarse and offers fair protection to the fruit. The skin is green in colour in the immature fruit, turning gradually to a yellow when mature. The flesh is green in colour, only medium in depth, medium coarse in texture, and juicy. The quality of the flesh is only fair, being rather sweet in flavour, with a desirable odour. Early Hackensack, as the name denotes, matures very early, and it is also a good yielder.

Nixon.—Although only a limited area of these melons has been grown in this country, last season they showed promise of becoming one of the most popular varieties ever handled. The fruit is rather large, but not excessively so—like some of the varieties now in cultivation in this State. In shape, the fruit somewhat resembles Early Hackensack variety, being fairly round, distinctly ribbed, and golden yellow in colour when ripe. The netting of this variety is scanty, although coarse, which is a distinct asset where the fruit has to be transported any distance. The flesh is deep, light green in colour, and salmon tinted at the seed cavity. The flavour and aroma are good. It is one of our earliest varieties.

Early Knight.—An early-maturing variety of good yielding qualities. The fruit is medium to small in size, and oval in shape, which is not a desirable feature. The netting of this variety is coarse, heavy, and covers the whole of the surface, almost covering up the ribs. The flesh is about 1½ inches in thickness, varying in colour from deep green at the skin to light salmon at the seed cavity. The seed cavity is moderate in size The variety has a flavour and aroma that may become popular on certain markets. Early Knight also belongs to the Rocky Ford group.

Sugar.—This variety is also known as Banana rock melon. It does not in any respect appear to be suited to our trade, but it may find a place in home gardens. The fruit is long, perfectly smooth, straw-coloured when ripe except along the sutures, which are dark-green. The flesh is very light in colour, deep, and mealy in texture. The flavour is mellow and mild, not oversweet, distinctive, and would not suit the average palate. The seed cavity is comparatively small. The outstanding features of this variety are the large size of the fruit and its heavy yielding qualities. However, the shape and lack of netting would prevent it being carried any distance in safety.

Cull "Duffer" Cows Promptly.

Some stockowners, when asked to cull out a cow that has proved worthless, will agree that it is a wise thing to do, yet, because a fair price has been paid for her, they will retain her in the hope that her daughters will give a better account of themselves. And, of course, it may happen that, with a good sire, the daughters will be superior to the dam. But even with good sires there will always be a certain percentage of disappointing results, and if one happens to purchase a bull bred on the same lines as the herd, the tendency to revert to the useless cow becomes much stronger. It is difficult to build up reliable strains from foundations of this sort, and the wisest plan is to cull the duffer as soon as she is discovered.—A. J. Gill, in the *Journal of Agriculture* of Victoria.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	G. C. Chapple, "Ondiong," King's Vale.
	H. J. Harvey, Kindalin, Dubbo.
	T. Jones, Birdwood, Forbes.
	T. Hooper, Glastonbury, Tootool.
	Hobson Brothers, Glenlea, Cunningar.
	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	W. J. Coddington, Granite View, Murrumburrah.
Canberra	E. J. Johnson, "Iona," Gunningbland.
	Quirk and Everett, "Narrawa," Wellington.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	W. W. Watson, "Woodbine," Tichborne.
	T. Hooper, Glastonbury, Tootool.
	H. J. Harvey, Kindalin, Dubbo.
	T. Jones, Birdwood, Forbes.
	W. G. Law, Wattle Park, Armatree.
	W. R. Carter, Allambie, Narromine.
	Manager, Experiment Farm, Trangie.
Clarendon	E. J. Johnson, "Iona," Gunningbland.
Currawa	Quirk and Everett, "Narrawa," Wellington.
Federation	E. J. Johnson, "Iona," Gunningbland.
	H. Owen, "Apple Grove," Duri.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. W. Watson, "Woodbine," Tichborne.
	E. K. King, Karrindee, Uranquinty.
	W. G. Law, Wattle Park, Armatree.
	W. R. Carter, Allambie, Narromine.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle Road, Parkes.
Firbank	Manager, Experiment Farm, Trangie.
Florence	Manager, Experiment Farm, Trangie.
Gresley...	E. J. Johnson, "Iona," Gunningbland.
	H. J. Harvey, Kindalin, Dubbo.
Improved Steinwedel ...	Manager, Experiment Farm, Trangie.
Major	T. Hooper, Glastonbury, Tootool.
	E. K. King, Karrindee, Uranquinty.
Marshall's No. 3	A. E. Kingham, Farm 1445, Murrami.
	W. G. Law, Wattle Park, Armatree.
	B. J. Stocks, Linden Hills, Cunningar.
Merredin	T. W. O'Brien, "Cooberang," Junee Reefs.

Wheat—continued.	
Nabawa...	Cullen Bros., Bunglegumbie, Dubbo.
	H. J. Harvey, Kindalin, Dubbo.
	N. C. Fitzpatrick, Erin Vale, Warre Warral.
Nizam ...	N. C. Fitzpatrick, Erin Vale, Warre Warral.
Riverina	Quirk and Everett, "Narrawa," Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	W. G. Law, Wattle Park, Armatree.
Turvey...	Quirk and Everett, "Narrawa," Wellington.
	E. A. Michael, Hill View, The Rock.
	Watt Brothers, "Fairy Mount," Cumnock.
	T. M. Slattery, Mirrool.
	H. J. Harvey, Kindalin, Dubbo.
	Hobson Brothers, Glenlea, Cunningar.
	W. G. Law, Wattle Park, Armatree.
Union ...	H. J. Harvey, Kindalin, Dubbo.
Waratah	E. J. Johnson, "Iona," Gunningbland.
	P. Page, Duri.
	Quirk and Everett, "Narrawa," Wellington.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	W. J. McGrath, Avon, The Rock.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	G. G. Ballantine, "Clifton," Ariah Park.
	J. McGrath, "Berra Lea," Goonumbla.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	W. W. Watson, "Woodbine," Tichborne.
	Chaffey Bros., Nemingha.
	Manager, Experiment Farm, Trangie.
	T. Jones, Birdwood, Forbes.
	H. J. Harvey, Kindalin, Dubbo.
	E. K. King, Karrindee, Uranquinty.
	Watt Brothers, "Fairy Mount," Cumnock.
	B. J. Stocks, Linden Hills, Cunningar.
	W. G. Law, Wattle Park, Armatree.
	W. R. Carter, Allambie, Narromine.
	W. J. Coddington, Granite View, Murrumburrah.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle Road, Parkes.
	J. Berney, "Kildara," *via* Cumnock.
Yandilla King...	A. E. Kingham, Farm 1445, Murrami.
	P. Gaynor, "Underwood," Ariah Park.
	A. A. Groves, "Aberfeldie," Barmedman.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	Quirk and Everett, Narrawa, Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	G. C. Chapple, "Ondiong," King's Vale.
	Bradford Brothers, Nubba.
	H. J. Harvey Kindalin, Dubbo.
	Hobson Bros., Glenlea, Cunningar.
	T. M. Slattery, Mirrool.
	R. A. Harricks, Horseshoe Vale, Warre Warral.
Oats—	
Algerian	C. Bennett, Forbes Road, Cowra.
Belar ...	C. Bennett, Forbes Road, Cowra.
Mulga ...	C. Bennett, Forbes Road, Cowra.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
Sweet Sorghums—	
Collier ...	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	D. Shearer and Sons, Glendon, via Singleton.
White African...	Principal, H.A. College, Richmond.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

THE PACKING OF MILKING MACHINES.

A CASE demonstrating the care needed in the packing of machinery that is to come in contact with milk or any of its products arose lately, the facts of which will interest many dairy farmers. The cream of a farmer had been consistently graded choicest until he introduced milking machines, from which time it had had to be graded down at the factory. The Department being appealed to, the Dairy Instructor for the district examined the cream at the factory, and found it had a very sweet and pungent flavour, very similar to resin. Visiting the farm and looking over the parts of the machines, the Instructor noticed that an odour could be traced similar to that of the cream, and he found the rubbers had the same taint. A trace of wood shavings was observed in the releaser head, and the information was elicited that the parts of the machines had arrived in boxes made of strong-smelling pine, and packed with shavings of the same timber. Moreover, the shavings had in some way become wet, and the rubbers and machinery had contracted a very strong smell of resin. The parts had all been washed before being used, but the cream had been "off" from the first. Upon new rubbers being put in and the parts being thoroughly washed the flavour entirely disappeared, as was observed at the factory next day.

The machinery firm was promptly advised to use some other kind of packing, while the farmer intimated that he considered he should be compensated. The facts once more illustrate the necessity for the greatest care in relation to everything through which milk passes or comes in contact.—L. T. MACINNES, Dairy Expert.

"THE BUSH BOY'S BOOK."

THIS handy little collection of camp and bush lore is, no doubt, intended primarily for the city youth who delights to relax in natural surroundings, but the material comprised in 320 pages is so copious and varied that the farmer who has sometimes to spend a night or two under canvas cannot but find it useful. The camp itself, the fire, the bed, the meal, the clothing, the sports, the road, the points of the compass are a few of the subjects that catch the eye—but they are only a few, for the mass of matter is great indeed. And when we add to fluent, easy forms of expression, the capacity that charmed us twenty years ago of introducing a living touch in a few words—a bush yarn, or a beauty of nature, a story of Ladysmith—we have surely commended a singularly healthy and attractive little book.

The author is Mr. Donald Macdonald, and the publisher, the Cornstalk Publishing Company, Sydney.

IF a farmer is one who receives any inspiration from beauty of environment then, to him, beautiful environment is worth while, and the most practicable, the most serviceable, and the most unselfish place for him to cultivate it is in the immediate home surroundings where it will be shared by every member of his household. Beauty is pleasing everywhere, but in the home it takes on a real value and becomes an actual utility.—J. M. KERR, in the Victorian *Journal of Agriculture.*

Poultry Notes.

FEBRUARY.

E. HADLINGTON, Poultry Expert.

THE question of the quantities of concentrates it is advisable to use in the ration for poultry is an oft recurring one, and frequently differences of opinion are heard with regard to some given method of feeding based perhaps on a limited experience, and claimed to be the last word in poultry feeding. However, those who have made a close study of the subject are not so apt to come to any definite conclusion without some years of experience to work upon. The necessity for repeated tests in any new departure will be apparent from the results of the experiments given below.

Feeding Experiments.

In 1924 a series of experiments was commenced at the Hawkesbury Agricultural College, Richmond. with a view to determining the amount of meat meal it was most satisfactory and economical to feed to laying hens. Those experiments have now been in progress for three years, and the results of each test are given for purposes of comparison.

In order to ensure uniformity in all these experiments, as far as practicable birds which were bred on the same lines and as near as possible of the same age were selected, and placed in the pens a month before the eggs were recorded. During this time they were graded up so that to commence with each group was as even as possible as regards laying.

The ration fed consisted of wet mash in the morning and grain for the evening feed in the following proportions:—

Morning Mash.

Lot 1.—Pollard, 66⅔ per cent.; bran, 33⅓ per cent; meat meal, nil.
Lot 2.—Pollard, 65 per cent.; bran, 32½ per cent; meat meal, 2½ per cent.
Lot 3.—Pollard, 63⅓ per cent.; bran, 31⅔ per cent.; meat meal, 5 per cent.
Lot 4.—Pollard, 61⅔ per cent; bran, 30⅚ per cent.; meat meal, 7½ per cent.

Common salt was used in the mash at the rate of 22 oz. per 100 lb.

Evening Feed.

Two-thirds wheat and one-third maize.

The first experiment, which was commenced in 1924, was carried out over the flush season of production, September to March, and the results were as tabulated below:—

THE 1924-25 TEST.

——	Meat Meal	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total	Average per Hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1—40 pullets ...	Nil.	786	718	693	624	567	269	86	3,643	91
,, 2—40 ,, ...	2½	761	764	637	615	492	271	146	3,686	92
,, 3—40 ,, ...	5	784	816	704	716	600	399	246	4,265	106·6
,, 4—40 ,, ...	7½	744	795	661	674	584	401	286	4,145	103·6

Each lot consisted of two pens of 20 birds.

These figures show that the group fed on 2½ per cent. meat meal laid 43 more eggs than those receiving no meat meal, and lot 3, which was fed on 5 per cent. meat meal, laid 622 eggs more than the 2½ per cent. lot, or a difference of nearly 52 doz. eggs in seven months. Yet the group which received 7½ per cent. meat meal laid 120 eggs less than the 5 per cent. lot.

With regard to the condition of the birds, there was a noticeable falling off in egg production in the no-meat-meal group during the concluding month, and the birds, besides finishing with a much lower egg yield than the other groups, also exhibited marked evidence of fag.

The following year, 1925–26, a further test was carried out over the whole twelve months, commencing in May and concluding in April. The rations fed were the same as in the previous one, and the number of birds was also identical. Particulars of the laying are given hereunder :—

THE 1925–26 TEST.

—	Meat meal.	May.	June	July.	Aug.	Sept	Oct.	Nov.	Dec	Jan	Feb.	Mar	Apr.	Total	Average per hen.
	Per cent	eggs.	eggs.	eggs.	eggs.	eggs	eggs	eggs	eggs	eggs	eggs	eggs	eggs	eggs.	eggs.
Lot 1 ...	Nil	101	116	396	547	629	629	467	526	431	311	200	10	4,363	109
„ 2 ...	2½	145	263	399	669	650	718	669	584	578	345	308	101	5,429	135
„ 3 ...	5	231	257	396	694	685	693	554	567	395	291	256	93	5,112	127
„ 4 ...	7½	257	320	509	761	774	727	606	616	544	346	313	100	5,882	147

The results shown are somewhat contradictory, due apparently to some abnormality occurring in some of the pens. The test is therefore far from conclusive. An analysis of the figures shows that the "2½ per cent. group" gave 1,066 eggs more than that receiving no meat meal, whereas the "5 per cent. lot" actually laid 317 eggs less than the "2½ per cent. section," while the "7½ per cent. group" exceeded the "5 per cent." by 770 eggs, and the "2½ per cent." by 453 eggs.

Results Compared with 1924.

Taking the figures in this experiment over the same period as in 1924, *i.e.*, from September to March, the results are as follows :—

Lot 1—No meat meal.	Laid 3,193 eggs.	Average 79 eggs per hen.
„ 2—2½ per cent. meat meal.	„ 3,852 „	„ 96 „ „
„ 3—5 per cent. „	„ 3,441 „	„ 86 „ „
„ 4—7½ per cent. „	„ 3,926 „	„ 98 „ „

Over this period it will be seen that there is only an average of two eggs per hen difference between the 2½ per cent. and the 7½ per cent. lots, and yet the 5 per cent. group only averaged seven eggs per bird more than the "no-meat-meal lot." The condition of the "no-meat-meal" group as regards fagging was similar to the first test.

Comparing these two experiments, in the first of which the 5 per cent. group laid 622 more eggs than the 2½ per cent. group, and 120 more than the 7½ per cent., it will be realised how undependable are the results of one or two years' trials.

The 1926-27 Experiment.

This experiment, with some variations, was continued again last year, 1926–27, the no-meat-meal group being omitted, and three pens of twenty birds each were used in the 2½ per cent. group, two pens of twenty birds in the 5 per cent., and three pens of twenty birds in the 7½ per cent. lot. There were not sufficient pens available to permit of three pens of each.

The test was carried out over the twelve months, June to May, but owing to some of the pens being required, only one pen of each was carried on during the last two months; therefore, in order to avoid any lack of uniformity the results are given covering the ten months only from June to March.

The rations fed were in the same proportions as in the first and second tests, and the results were as given below:—

THE 1926–27 TEST

	Meat meal	June	July	Aug	Sept	Oct.	Nov	Dec	Jan	Feb	Mar	Total.	Average p hen.
	per cent.	eggs.	eggs	eggs.	eggs	eggs.	eggs.	eggs.	eggs	eggs.	eggs	eggs.	eggs.
Lot 1-60-Pullets	2½	621	772	1,037	1,211	1,126	1,035	959	613	410	250	8,034	133 9
Lot 2-40-Pullets	5	357	504	669	800	773	708	652	453	320	195	5,431	135 7
Lot 3-60-Pullets	7½	596	810	1,052	1,178	1,191	1,115	1,010	639	568	413	8,572	142 8

These results show an average difference of approximately only two eggs per hen between the 2½ per cent. and 5 per cent. groups, and an average of seven eggs per bird between the 5 per cent. and the 7¼ per cent., in favour of the latter.

However, if we take the figures over the flush period of production for comparison with the two previous years' experiments, we find a progressive increase from the 2½ per cent. group to the 7½ per cent. as follows:—

	2½ per cent. meat meal.	5 per cent. meat meal.	7½ per cent. meat meal
Average	93·4	97·5	101·9

This, taken by itself, would appear to indicate that the higher percentage of meat meal gave the best results, especially as the 7½ per cent. lot finished in somewhat better condition than the other groups, and without the results of the two previous tests one might reasonably come to that conclusion, but in face of the 1924–25 results and the contradictory figures of 1925–26, further evidence is required before we can come to a definite conclusion.

It is proposed to carry out additional tests as opportunity offers.

Maize Feeding Experiment.

In 1925–26 an experiment was commenced in connection with the feeding of varying quantities of maize and wheat for the evening meal, in conjunction with the usual wet mash in the morning. The inauguration of this experiment was not due to any doubt by officers of the Department as to the value of maize for poultry, but it was brought up by a request from the Aylmerton branch of the Agricultural Bureau for data on the subject, and the experiment

was arranged with the object of obtaining data that would prove that maize feeding is both scientific and practicable. The matter is of considerable economic importance to poultry farmers, especially when there is a marked disparity between the prices of wheat and maize, as, for instance, in the year prior to the commencement of this test, when wheat was 6s. per bushel and more, and maize 4s. A similar position exists at the present time, and many poultry farmers who cling to the old fallacy that maize is too fattening do not use as large a proportion as they might. These experiments have now been carried on for two years, the first commencing in May, 1925, and terminating in April, 1926, and the second covering the period June, 1926, to May, 1927. In the latter period, owing to some of the pens being required for other work, only one pen in each lot was continued after March; the results have, therefore, been taken for the ten months June to March, when the pens were complete. Both trials were arranged in the following order:—

Lot 1.—20 pullets ... ... Fed maize only.
Lot 2.—20 „ ... ... Fed two-thirds maize, one-third wheat.
Lot 3.—20 „ ... ... Fed one-third maize, two-thirds wheat.
Lot 4.—20 „ ... ... Fed wheat only.

The results were as follow:—

THE 1925-26 TEST.

——	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	Total.	Average per Hen.
	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	151	159	277	320	331	345	328	340	378	186	240	90	3,145	157
„ 2 ...	114	149	207	293	273	346	287	298	275	139	152	67	2,600	130
„ 3 ...	166	195	264	315	348	342	335	335	345	200	245	57	3,147	157
„ 4 ...	135	153	224	308	275	304	312	296	327	145	116	12	2,607	130

These results show the "all maize" lot laid the same number of eggs as the lot fed one-third maize and two-thirds wheat, *i.e.*, an average of 157 eggs per bird, while the lot fed two-thirds maize and that fed all wheat were equal to one another, laying an average of 130 eggs per hen.

The results of feeding the grains in the different proportions in this test were somewhat contradictory, probably due to the presence of some abnormal factor.

If, for purposes of comparison, we take the figures for the same period as the second test, viz., June to March, the result is only slightly altered, as will be seen from the following averages:—

LAYING, June to March, in First Test.

Lot 1—All maize,	**Average per hen,**	**145**	**eggs.**
„ 2—⅔ maize, ⅓ wheat,	**„ „**	**120**	**„**
„ 3—⅓ maize, ⅔ wheat,	**„ „**	**146**	**„**
„ 4—All wheat,	**„ „**	**123**	**„**

In the second experiment the lot fed all maize and that fed two-thirds maize and one-third wheat show much better egg-production than the other two lots, but further experiments would be necessary to definitely

determine the question. However, the results should reassure those who hesitate about using a fairly large proportion of maize. The figures for this second test were as follows :—

THE 1926–27 TEST (10 months only.)

	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec	Jan.	Feb	Mar.	Total.	Average per hen.
	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	169	233	373	381	384	334	312	222	172	189	2,769	138·4
„ 2 ...	177	201	362	425	400	341	335	266	173	119	2,799	139·9
„ 3 ...	161	223	309	339	379	311	332	250	140	127	2,571	128·0
„ 4 ...	172	251	334	363	361	329	344	277	115	103	2,649	132·4

With regard to the condition of the birds at the conclusion of the test, those fed on all maize showed slightly the best, but not more so than might occur in any groups of birds.

Reviewing these experiments generally, allowance has always to be made for "experimental errors," and the variations seen in the results of both the meat-meal and the maize feeding experiments exemplify what may be expected in any such tests under the most uniform conditions. It is well, therefore, to emphasise the necessity for caution in accepting the results of any trials which are not based upon proper and systematic experiments.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.
Pambula (L. K. Longhurst) ..	Feb.	15, 16
Cessnock (D. B. McGilvary)	„	16, 17, 18
Castle Hill (W. H. Taylor) ..	„	17, 18
Parramatta (W. H. Taylor) ..	„	17, 18
Newcastle (E. J Dann) .. .	„	21 to 25
Uralla (D. G. Evans)	„	22, 23
Gunning (G. E Ardell)	„	23, 24, 25
Blacktown (A. J. Greenaway) ..	„	24, 25
Kangaroo Valley (L. W. Vance)..	„	24, 25
Dorrigo (J. H. Skeoch)	„	28, 29
Inverell (E. A. Clarke)	„	28, 29, Mar. 1
Tumut (H. Mount)	„	29, Mar. 1
West Maitland (M. A. Brown) ..	„	29 to Mar. 3
Bellingen (J. F. Reynolds) ..	Mar.	1, 2
Nabiac (E. A Carey)	„	2, 3
Robertson (J. K. Hamilton) ..	„	2, 3
Penrith (C. H. Fulton)	„	2, 3
Nimmitabel (R. Draper)	„	5 to 8
Tumbarumba (M. Kinstler) ..	„	6, 7
Glen Innes (G. Donald)	„	6, 7, 8
Nimbin (S. H. Kilminster) ..	„	7, 8
Walcha (A. D. Murchie)	„	7, 8
Braidwood (R. L. Irwin)	„	7, 8
Yass (C. N. Howard)	„	7, 8, 9
Taree (R. Plummer)	„	7, 8, 9
Moss Vale (W. Holt)	„	8, 9, 10
Rydal (H. Murray).. . .	„	9, 10
Gundagai (P. J. Sullivan) ..	„	13, 14
Crookwell (P. R. Marks)	„	13, 14, 15
Armidale (A. McArthur)	Mar.	13 to 16
Adaminaby (P. L. Crisp).. ..	„	15, 16
Mudgee (O. Watkins)	„	15, 16, 17
Orange (G. L. Williams)	„	20, 21, 22
Tamworth (E. E. Upjohn) ..	„	20, 21, 22
Quirindi (G. Curtis) . ..	„	21, 22, 23
Kempsey (N. W. Cameron) ..	„	21 to 23
Goulburn (T. Higgins)	„	22, 23, 24
Blayney (J. H Moore)	„	27, 28
Batlow (C S. Gregory) . ..	„	27, 28
Coonabarabran (C. D. Cox) ..	„	27, 28
Molong (W. P. Stanger) . ..	„	27, 28
Muswellbrook (R. C. Sawkins) ..	„	27, 28, 29
Sydney Royal (G. C. Somerville).	April	2 to 11
Narrabri (W. A. McDonald) ..	„	18, 19
Gloucester (M. Newton)	„	18, 19
Wee Waa (D. B. Martyn).. ..	„	24, 25
Wingham (D. Stewart)	„	25, 26
Grafton (L. C Lawson)	„	25 to 28
Forster (W. Poppenhagen) ..	„	27, 28
Casino (P W. Swanson)	May	1, 2, 3
Maclean (T. B. Notley) . ..	„	2, 3
Dungog (W. H. Green)	„	2, 3, 4
Kyogle (D Campbell)	„	9, 10
Gresford (A. R. Brown)	„	11, 12
Narandera Sheep Show	July	18
Wagga Wagga (F. H. Croaker) ..	Aug.	21,
Junee (G. W. Scrivener)	„	28, 29
Ganmain (C. C. Henderson) ..	Sept.	11, 12
Narandera (J. D. Newth) ..	Oct.	9, 10

Orchard Notes.

FEBRUARY.

C. G. SAVAGE and H. BROADFOOT.

THE varieties of apples grown for export should possess among other things—

(1) Good carrying qualities.
(2) Good flavour and appearance, and
(3) Be popular with agents and consumers.

The chief early export variety is Gravenstein. This variety is not extensively grown as it does not hang well, and very often falls before showing any colour. Some of the chief export varieties are Jonathan, Delicious, Rome Beauty, London Pippin, and, during the last few years Granny Smith has been commanding the attention of overseas buyers. When picking fruit for export, it is absolutely essential that it should be handled carefully, as well as expeditiously. Growers must realise that the keeping qualities of an apple depend more upon the skin being kept in a sound unbroken condition than upon any other factor. When the skin is broken common rot organisms gain entrance and quickly cause the decomposition of the fruit. This rot spreads from one fruit to the other.

Growers who pick, pack, and market their fruit in the course of a few days do not fully realise how necessary it is to handle fruit carefully, but those who hold fruit in common or cold storage, fully realise what careful handling means and the beneficial effect it has on the storage life of fruit. In the case of fruit exported to London it is approximately eight weeks before the apples reaches the consumer, and for fruit to open up at that time in good condition it must be perfectly sound when packed.

Picking while the fruit is wet should be avoided, and it is also advisable, as far as possible, to avoid picking in the heat of the day; if picking cannot be delayed, then the cases should be placed in the shade of the tree so soon as they are filled, and carted to the shed as soon as the load is ready. There the cases should be stacked overnight so as to allow the fruit to cool. When stacking a space should be left between the tiers so that there will be a free circulation of air. This will help considerably in cooling the fruit.

To secure the best results it is necessary to make several pickings according to the size of the crop and variety of fruit. All the apples on a tree do not reach maturity simultaneously, and therefore if several pickings are made the size and quality of the fruit will be more uniform. This will assist in facilitating the sizing, grading, and packing, and there will also be a gain in quality and quantity, as the immature specimens will have a chance to develop, and so improve in size and appearance.

The correct time to pick apples is most important, but after a little experience a grower can tell to a nicety when he should commence operations. The colour of the seeds and the blush or colour of the variety are in some measures guides to proper maturity, but they are not absolutely dependable. The safest guide is the ground colour of the fruit. The ground colour, which is green before the apple begins to mature, gradually lightens, and turns yellowish as maturity is reached, and until this change has taken place the apples are not in the best condition for export. Over-ripe apples should not be shipped, as this is as serious as immaturity, if not more so.

When picking be careful not to pull away the stalk, place the fruit carefully in picking bags, empty carefully into boxes, which are quite free from grit or splinters or protruding nails, as these will puncture the skin and allow the entrance of common rot organisms. The carting to the shed should be done in a careful manner; jolting the fruit over rough roads should be guarded against.

The size of the apples is a very important factor. Generally speaking, sizes ranging from 2¼ to 2¾ inches will keep for longer periods than large apples, but the difference is not so much due to the size in itself as to the forcing that induces the size, and the poor colour that usually accompanies it. In addition, there is a better demand for apples ranging from 2¼ to about 2¾, as buyers like a case containing a good count, and consumers prefer a whole medium-sized apple to a section of a large one. Small apples, on the other hand, are just as undesirable as large ones.

The packing of fruit is an art, but the sizing machine has greatly assisted the packer in carrying out the work more expeditiously and effectively. Grading for quality must still be done by eye and hand, but unless fruit is properly sized it cannot be properly packed. As regards packing, each apple should be carefully wrapped, and the wrap finished over the stalk; this is most important as it protects the fruit from stalk punctures. It is appalling how great is the loss caused by blue and other common moulds entering the fruit by way of a stalk puncture or finger-nail mark. The wraps should be large enough to completely cover the fruit.

As most growers are familiar with space-packing, due to a large extent to the energies of the Fruit Branch in conducting packing classes, it is not intended to enlarge upon it here, but it is important first to wrap the fruit carefully, to place each individual fruit firmly in its place, and finish the pack so that there is a slight bulge. If the pack is finished slack it will not present a good appearance when the case is opened, as after several weeks a certain amount of shrinkage takes place, and consequently the fruit will arrive in a very slack condition. On the other hand, packing too high is undesirable, as when the lid of the case is being nailed down the fruit will be badly bruised. There is often a tendency on the part of packers to rush things. Many packers are quick and neat, whilst others who try to get up too much speed do so to the detriment of the pack.

Growers should not let the packers operate at a speed that is likely to adversely affect the fruit. This applies mostly to those engaged on piece-work.

It is important to have a good strong case, and for export the softwood Canadian is undoubtedly the most suitable. It is liked by buyers, is attractive, very suitable for space-packing, and for getting a bulge on top and bottom after the fruit is packed.

A good attractive label is of great importance as something which appeals to the eye certainly stimulates sales. Rough, badly-marked cases retard rather than assist in the sale of fruit.

Only clean new cases should be used, and they should be lined with clean white paper; a little wood wool placed at the bottom of the case and on top of the fruit when packed is strongly recommended. The wiring of the case is highly desirable. There are a good many machines on the market which do the wiring quickly and effectively. Two wires are placed round each box, one about 1¾ inches from each end. The wiring adds stability to the case, and there is far less likelihood of breakages occurring and less danger of the contents being pilfered. Before the cases are being loaded into the truck, see that the trucks have been swept out and are clean and dry.

The cases should be stacked in such a way that there will be no danger of any of them toppling over during transit. On no account should the cases be stacked on the bulge, and men engaged in loading fruit should be prohibited from walking over the cases. It might be pointed out that, generally speaking, up to the present time New South Wales has been able to market locally practically all the apples produced, and while this state of affairs exists it would not be a sound policy for our growers to consign fruit overseas at a comparatively heavy cost and at a greater risk of loss during transit, but with the amount of suitable land available and the quality of fruit that can be produced, the day will come when it will be necessary to export yearly a portion of our crop. When that day does arrive, growers should be conversant with the requirements of the business, in order that the many pitfalls frequently encountered may be avoided.

Cultivation.

This is the month when trees are forming blossom buds for the following season, and as a consequence every possible step should be taken to make conditions for the tree as nearly ideal as possible. The soil around the trees should be maintained in an open and loose condition, as this assists in conserving soil moisture. To the good orchardist the formation of surface crust, which facilitates the loss of moisture by capillarity, is anathema, as such a soil condition militates against the formation of numerous vigorous buds for the ensuing season. Tilth should be good, soil moisture should be conserved, and everything possible should be done to keep the tree in a

vigorous healthy condition. Not merely is maintenance of life in the tree required—the great desideratum is the maintenance of healthy vigorous reproductive life.

Tree Records.

While it is not practically possible for any grower on a large scale to keep a mathematically accurate record of the produce of each tree, it is desirable that he should have such knowledge of his trees that he can distinguish between those which produce fair average crops and those which carry above or below the average. The last is perhaps of greatest importance. Productivity per acre depends after all upon productivity per tree, and the orchardist should form an estimate of the crop of each tree. As time goes on, he will find his power to form a correct estimate grows until he becomes reasonably accurate in forming an estimate of his tree crop. Trees of poor average productivity should be suitably treated, and if unresponsive should be removed.

Fruit for Canning.

It has been said of fruit that people should "eat what they can and can what they can't." On the Murrumbidgee Irrigation Areas a large portion of the fruit is produced for canning purposes, and that area is a scene of great activity this month in the harvesting of peaches which are forwarded to the canning factory. Peaches for canning should be neither under- nor over-ripe. It is a mistake to think that anything will do for the canning factory. For canning fruit should be ripe (not over-ripe), sound, firm, normally-sized, and developed. This indicates how much depends upon the grower. Badly-handled, ill-conditioned fruit is just as little wanted and as much out of place in the canning factory as in the market.

Budding.

If the orchardist has any trees whose development and yield are unsatisfactory he may rework them if they are in good condition. Budding wood should be taken only from proved trees whose qualities are worth transmitting.

Manuring.

Most plants draw more or less heavily upon reserves of plant food in the soil, and as these reserves are not inexhaustible it is essential that manure or fertiliser should be used. Fertiliser or manure should be applied to citrus trees during February, and they should be distributed and worked into the soil around the outer circumference of the trees.

Pests.

Measures against codling moth must be carried on with unremitting energy, and should be both preventive and remedial. As cases returned to the grower sometimes contain codling moth grubs they should be immersed in boiling water for not less than three minutes, and all grub-infested fruit should be burnt or boiled before the grub has a chance of leaving the fruit.

February is a suitable month for the spraying or fumigation of citrus trees, but neither of these operations should be carried out upon trees which are suffering from lack of moisture or poor cultivation. There is no doubt that fumigation is the most potent means at our disposal for controlling scale pests which infest citrus trees. A leaflet on the subject may be obtained free on application to the Under Secretary, Department of Agriculture, Sydney. If spraying with a miscible oil is resorted to the work should be carried out on a cool day.

"The Fluid Milk Market in England and Wales."

The production, handling, and sale of milk is a matter of national importance, and many have been the inquiries, investigations, and discussions on every aspect of the subject. The document now before us is a report compiled by Mr. R. S. Forrester, Cassel Reader in Commerce in the University of London, at the request of the British Ministry of Agriculture and Fisheries, and though chiefly relative to the conditions obtaining in England and Wales, it is deserving of the careful study of all interested in the larger problems of the milk industry. The drift of his survey of the subject is that expansion of the consumption of milk in England is desirable and possible, and that the road to that increase lies through emphasis upon the quality of the article and guarantees of safety, and specially upon improvement in the status of ordinary milk. With these as the basis of confidence, methods of publicity should be employed, and public authorities should lend support in securing adequate supplies of good milk for all young people.

The many avenues that run off that thoroughfare have been most carefully explored, and the result is a discussion of the whole subject which is thoroughly worthy of a place in the important "Economic Series" touching the marketing of many agricultural commodities, issued by the Ministry of Agriculture.

Factors that Regulate the Fat in Milk.

The percentage of fat in cows' milk is now often taken as an index of quality from the legal standpoint, and also as a means of comparing the productivity of one cow with another. The factors which influence the percentage of fat are now fairly well known, and in this country are usually classified under the following heads:—(*a*) Breed of Cow, (*b*) Individuality of Cow, (*c*) Period of Lactation, (*d*) Interval between Milkings, (*e*) Efficiency of the Milker, (*f*) Age of the Cow, (*g*) Climate and Weather Conditions, (*h*) Health of the Cow, and (*i*) Kind and Quality of Food.

Although the effect of most of the above factors can be stated in general terms, research work is continually proceeding with a view to obtaining more precise information as to the effect of each factor under special conditions. Thus climate and weather conditions include season of year and temperature, and it is important that any definite effect due to these agents should be distinguished from the effects of naturally accompanying agents such as pastures, advance in lactation, &c.—J. Mackintosh in "Agricultural Research in 1926."

1st *March*, 1928.

CONTENTS.

VOL. XXXIX. PART 3. MARCH 1. 1928

Agricultural Gazette of New South Wales.

Crop-growing Competitions, 1927.

THE JUDGES DISCUSS THE METHODS ADOPTED.

DUBBO AND ADJACENT DISTRICTS.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

THE farmers in this portion of the western district have been up against unfavourable abnormal seasonal conditions this year, yet six local associations were able to carry out crop competitions, viz. :—Coonabarabran, Cumnock, Dubbo, Gilgandra, Narromine and Wellington. The entries totalled sixty-six; while the number of entries at Gilgandra, Dubbo, Cumnock, and to a lesser degree Narromine, was up to the average of other years, the responses at Wellington and Coonabarabran were disappointing, and showed poor appreciation by the local farmers of the efforts of their associations to encourage and stimulate "better farming" methods.

The promotion of crop competitions within the wheat belt is State wide and no Pastoral, Agricultural and Horticultural Association can afford to drop behind if their district is to be kept on the wheat-growing map, particularly in view of the encouragement given by the Royal Agricultural Society in conducting divisional championship competitions, and the publicity given by the Sydney and local press. The educational and also the ultimate financial benefits to both the individual and district are undoubted, and the movement must continue to grow; it therefore behoves all agricultural associations to look upon these competitions as one of their most important functions for the benefit of the community.

The Season.

Abnormal is the best word to describe the season just experienced. It is a rare occurrence for the winter rains to fail, yet from May till August the aggregate fall at all centres barely exceeded 2 inches. Not even in the drought years of 1888, 1902, 1908 and 1918 did the aggregate rainfall for those months fall so low. It is not surprising, therefore, that crop yields are likely to be low in the aggregate, and the surprise is that the better farmed soils have responded so well. Undoubtedly the wheat plant is a hardy cereal if given a reasonable chance to establish itself, and it is only those crops which were sown early under favourable conditions which have given fairly payable returns. Conditions were not good even for the preparation of fallows. Too much moisture in the autumn and winter of 1926 delayed ploughing until August or September, and this was followed

by dry spring and early summer conditions, which prevented fallows from being given the important cultivation prior to harvesting. Heavy rains at Christmas time came at an inconvenient time for farmers to take full advantage of them, and, in any case, full benefit was not received owing to run-off occurring on caked surfaces. The falls during January, February and March were light and patchy, and it was not until Easter time in April that good soaking rains were experienced. Those farmers who were prepared immediately became busy with seeding operations, and the areas put in from mid-April to early May germinated satisfactorily, and became well established in warm moist ground, particularly those crops assisted by superphosphate—its action being to stimulate the early root development, and put it in touch with moisture reserves in the sub-surface soil areas. Most crops sown after mid-May germinated patchily, and were held back and stunted by the abormal succession of severe frosts right throughout the winter well into September. The dry conditions from May till the end of September did not help the position, and the wonder is that crops were able to hold out so long. Many were fed-off as hopeless, especially as the provision of sheep feed was a paramount consideration with many farmers. Good rains at the end of September and early October saved the situation from being practically a total failure, and all crops which had hung out that long made a wonderful recovery; as a consequence quite a considerable area has been stripped. While it is estimated that the average yields cannot exceed two bags per acre, it is interesting to note that the estimated apparent yields of the competition crops is just on 20 bushels per acre. This surely should be a striking object lesson of the manifold advantages of fallow and other better farming methods.

The rainfall for the fallow and growing period at the various centres was as follows:—

RAINFALL Records.

Month.	Coonabarabran	Cumnock.	Dubbo	Gilgandra	Narromine	Wellington
	Points.	Points	Points.	Points.	Points.	Points.
Fallow period July, 1926, to April, 1927	1,854	1,468	1,542	1,304	1,155	1,895
Growing period, 1927—						
May	20	42	23	8	16	23
June...	160	75	70	106	53	63
July	9	59	8	50	3	12
August	64	61	108	88	134	137
September	32	239	117	77	193	112
October	254	122	167	136	177	162
Total	539	598	493	465	578	509
Grand Total	2,393	2,066	2,035	1,769	1,733	2,404

Cultural Details.

All crops, with one exception, were sown on fallowed land. Three were on land which had been long summer fallowed, and this practice has much to commend it in the better germination obtained, the greater control of weeds and of fungous diseases in the soil, and the more even distribution of the work over the year. All farmers who fallow should attempt to prepare a portion of their intended fallow by this means, and they will not be disappointed with the results obtained. Winter fallowing varied from June till September, the greatest proportion of the work being done in July and August.

Mouldboard ploughs were used somewhat more than discs, the proportion being thirty-seven to twenty-nine. While, generally speaking, the mouldboard plough does the best work—ploughs to a uniform depth and does not tend to pulverise the soil—there are many types of soils in this district that can be worked satisfactorily with the disc plough when ploughed early.

The number of workings given to the fallows varied considerably in the six districts, varying from an average of 2·5 at Wellington to 5·8 at Dubbo. The average number of workings of all competitors was four. Farmers at both Dubbo and Narromine are realising the advantages of frequent workings, when necessary, as instanced by an average of 5·8 and 5·5 respectively.

These cultivations besides conserving moisture by providing a suitable mulch, also assist to improve fertility by promoting greater aeration and bacterial activity.

The implements mostly used were the springtooth combine or cultivator and harrows, but the various disc cultivators were also frequently used. There is a tendency to make this class of implement do the work of weed control (to the detriment of sub-surface consolidation and cloddiness of the mulch), when it should have been done earlier by harrows or springtooth implements. There is another type of implement which should receive the favourable attention of farmers in the west, and that is the rigid tyne Wimmera scarifier, which is largely used with success by southern farmers in this and other States.

Time of Seeding.

Once again early seeding has scored. It seems advisable to sow as early as possible in the light of the past four years' experience, even to the extent of sowing early-maturing varieties apparently out of season, and running the risk of possible frost damage. By early sowing, when it is possible to obtain a satisfactory germination, the wheat plant gets well established in a comparatively warm soil which encourages root growth, and it is then able to withstand many trials and adverse conditions during the winter and spring months if necessary. On the other hand, late-sown crops do not always germinate satisfactorily in cold ground, do not stool well, and are more subject to the influences of the prevailing seasonal conditions.

Rate of Seeding.

The average amount of seed applied per acre in the various districts compared with past years was as follows :—

District.	1925.	1926.	1927.
	lb.	lb.	lb.
Coonabarabran	...	...	52·5
Cumnock	57	57	60
Dubbo	55	53	58·6
Gilgandra	47	53	55
Narromine	45	48	51·5
Wellington	56	55·5	60

It will be noted that there is a distinct tendency to increase the amount of seed in all centres, thereby conforming with the trend of progressive farming throughout the whole wheat belt. These increases are really much greater than appears from the figures owing to a more general adoption of grading and dry treating the seed, both of which tend to give better germination results.

Seed Treatment.

The following table showing the treatments given the seed is very instructive as it shows how rapidly the outstanding advantages of the dry copper carbonate treatment for seed wheat as a bunt or stinking smut preventive have been given recognition by farmers who are prepared to adopt anything to their advantage.

District.	Dry treatment.	Formalin.	Bluestone.	Total entries.
Coonabarabran ...	2	...	...	2
Cumnock	10	1	...	11
Dubbo	16	2	...	18
Gilgandra	14	4	1	19
Narromine	9	1	2	12
Wellington	4	...	...	4
	55	8	3	66

The percentage of crops dry treated was 83, compared with 78 for 1926, and it is a striking recommendation of this treatment that bunt was not seen in any crop inspected.

Varieties of Wheat.

Twenty-one different varieties were used by the sixty-six competitors but fifty-three used six popular varieties, namely :—Waratah, Turvey, Yandilla King, Canberra, and Federation in order of popularity. The varieties placed in each of the competitions were as follows :—

District.	First place.	Second place.	Third place.
Coonabarabran	Marshall's No. 3.	Waratah.	....
Cumnock	Currawa.	Turvey.	Marshall's No. 3.
Dubbo	Waratah	Marshall's No. 3.	Turvey.
Gilgandra	Turvey.	Turvey.	Dart's Imperial.
Narromine...	Minister.	Yandilla King.	Canberra.
Wellington	Hard Federation.	Turvey.	Yandilla King.

Turvey has the best record with one first, three seconds and one third, closely followed by Marshall's No. 3 and Waratah. It is interesting to note that ten of the total number of varieties were late maturing, five mid-season, and six fast growers.

Slow-growing wheats, with the exception of Waratah, have given the most consistent high yields owing to better stooling qualities and slowness of growth enabling them to derive the most benefit from the late spring rains.

Fertilisers.

The following table shows the amount of superphosphate used this year as compared with other years :—

District.	No. of Crops Manured.	Variation 1927.	Average.		
			1925.	1926.	1927.
		lb. lb.	lb.	lb.	lb.
Coonabarabran	1 out of 2		......	......	50
Cumnock	10 " 11	45 to 70	51	47	57
Dubbo	14 " 18	46 " 90	54	57	65
Gilgandra...	15 " 19	28 " 70	53	57	50
Narromine	7 " 12	40 " 60	42	43	51
Wellington	0 " 2	....	49	50	...

It will be noticed that there is a distinct tendency to increase the amount applied of this invaluable aid to increased yields. The increase is greater than appears as all superphosphate is now high grade and contain 22 per cent. phosphoric acid compared with 17 per cent. in the old standard product. While the greater percentage of farmers in the west have not yet realised the advantages to be derived from a proper understanding and use of superphosphate with their crops, and there is yet some doubt about its efficacy on certain types of soils and in certain localities, its use is gradually spreading, largely with beneficial results. Its main action is in stimulating the early root growth, thus enabling the plant to draw on a larger area of the soil for its moisture and plant-food requirements in solution. An average amount of 56 lb. per acre on practically all types of soils which have been well fallowed can be safely recommended, as the main factor for success is an adequate supply of moisture in the soil.

Diseases.

This year disease and frost reduced the yield of many crops seriously, and the fungous disease responsible for most of the damage was flag smut (*Urocystis tritici*), which developed very prominently, probably because seasonal conditions were in its favour at seeding time. It is causing serious economic losses in many crops, and the problem of controlling it will have to be tackled immediately by scientists and farmers alike. Certain varieties such as Canberra, Hard Federation, Federation, Waratah and Turvey seem more liable to it than others, while a certain few varieties show a high

degree of resistance to this disease under field conditions, namely:—Nabawa, Florence, Riverina and Wandilla, and it would appear that these varieties will become popular until plantbreeders in conjunction with biologists evolve other and better yielding resistant varieties. Burning of stubbles and good cultural methods will also assist to minimise infection from fungous spores inhabiting the soil.

Other diseases such as foot rot and take-all were not prevalent this season, and did comparatively negligible damage. Loose smut was noticeably worse, particularly in Canberra and Turvey. No rust was seen.

PARKES AND ADJACENT CENTRES.

H. BARTLETT, H.D.A., Senior Agricultural Instructor, and J. A. O'REILLY, H.D.A.

The western wheat growing district rarely experiences what might be termed average seasonal conditions throughout the fallowing and crop growing periods, and it seems that some different or adverse factor occurs to influence the production of each crop. This makes a strict adherence to the theoretical principles of fallowing and crop sowing unwise, and yet the occurrence of disturbing influences is not so marked as to warrant a re-arrangement of farm practice and routine. Looking backward, errors in judgment may appear prominent, and the wish may be expressed that some work had been done differently, and provided such change is not a big departure from accepted principles, it is worth noting and perhaps following when somewhat similar conditions promise to recur.

It is always wise to make provision for some elasticity with farm work, particularly with regard to the initial preparation and the subsequent working of the fallow, the choice of varieties, time of sowing, amount of seed and superphosphate, &c., but such elasticity should not countenance delay or anything tending to false economy with seed and superphosphate.

The past season presented its problems, and in some centres the preparation of the fallows was delayed past June, 1926, and wisely so. Excessive rains in the autumn of 1926 and the subsequent frequent light falls of June and July kept many soils in too wet a condition for ploughing. When the ploughing of such soils did occur, "pugging" was the result, and a harsh lumpy surface persisted till sowing time, despite frequent workings. Due to the heavy autumn rains and dry early spring, the land hardened rapidly, and the fallows were difficult to prepare. Good rains in December, 1926, and January and March, 1927, however, enabled the fallows to be worked to advantage, and most of them were in medium to good condition at time of sowing, though there was a tendency for the moisture to be rather too far below the mulch, which made the depth of sowing a debateable point. If deep sowing is followed by substantial rains, the seedlings may fail to push through a firmed surface, while shallow sowing in a seed-bed where

the moisture content is variable and in which partial germination may take place if subjected to light showers, may also result in poor germination. However, light showers subsequent to sowing favoured deep planting.

The period from May till towards the end of September was particularly dry, many centres registering 2½ inches or less, and the position in the western district was very serious. Just prior to the break in the weather on 23rd September, a complete crop failure was probable, but bounteous rains from 23rd September onwards through October relieved the position, and medium to good crops were harvested.

The rainfalls at the principal centres were as follows :—

RAINFALL for Fallowing and Growing Periods.

——	Parkes.	Forbes.	Wongalea.
Fallowing period—June, 1926, to April, 1927.			
1926.	Points.	Points.	Points.
June	180	130	162
July	140	76	113
August	180	129	115
September...	88	225	82
October	30	51	23
November	1	Nil.	Nil.
December	405	142	285
1927.			
January	571	267	290
February	7	39	25
March	166	138	240
April	115	74	114
Total during fallowing Period	1,883	1,271	1,449
Growing Period—May, 1927, to October, 1927.			
May	58	102	40
June	107	107	78
July	31	59	35
August	130	108	70
September...	227	219	170
October	225	92	110
Total during Growing Period	778	687	503
Grand Total ...	2,661	1,958	1,952
From 1st May, 1927, to 21st September, 1927 (five months) ...	352	595	278

The Competitions.

The number of crop competitions promoted in this portion of the western district is increasing. The P. A. & H. Associations' competitions increased from six to seven over those of last year, and the Agricultural Bureau from one to three, making this year's total ten in all. The Agricultural Bureau entries are embraced in the P. A. & H. Association's territory, and so do not

compete for championship honours. As crop competitions have been conducted for several years it is possible to summarise comparable data which show the trend of the factors contributing towards increased yields.

Superphosphate.

The appended tables show the number of competitors in each competition, the number of crops manured or unmanured, and the average amount of superphosphate applied per acre.

TABLE showing use of Superphosphate.

Locality.	Number of—			Average Amount Superphosphate per acre.
	Competitors.	Crops Manured.	Crops not Manured.	
				lb.
Parkes	19	19	......	64
Forbes	10	10	......	60
Peak Hill	8	8	......	61
Tullamore	11	11	......	49
Trundle	13	13	......	56
Bogan Gate ...	12	12	......	55
Nelungaloo	9	9	......	66
Coradgery	7	6	1	58
Tichborne	6	6	......	54
Manildra	8	6	2	62
Totals ...	103	100	3	......

It is inadvisable to average the amount of superphosphate applied per acre over the whole of the area as the amount would vary in the different localities. The average quantity of superphosphate per acre applied to crops in the competitions of late years has been :—

Locality.	1924.	1925.	1926.	1927.
	lb.	lb.	lb.	lb.
Parkes	42	53	57	64
Forbes	42	42	51	60
Peak Hill	......	36	50	61
Tullamore	......	......	38	49
Trundle	39	40	40	56
Bogan Gate ...	......	40	50	o5
Nelungaloo	......	......	......	66
Coradgery	33	40	45	58
Tichborne	......	......	......	54
Manildra	......	......	......	62

As all high grade superphosphate was used in 1927, the amounts used in the earlier years—mostly of standard grade—are expressed in terms of high grade superphosphate.

The figures show in every locality farmers are annually increasing the amount of superphosphate per acre. Such increase is co-related to the increase in the number of workings which the fallows receive, and several farmers have applied up to 90 lb. per acre, and intend sowing that amount to the

whole of their fallowed land at next sowing period. The opinion that superphosphate may burn off the crop is now rarely expressed, and such a happening has never been observed by the writers. A feature of the past season was the success attending liberal manuring of the heavier rich type of soil where the fallow was well prepared. An experiment may be mentioned which was established on rich black clayey loam soil at Gunningbland, where 200 lb. superphosphate give a yield of 42 bushels 10 lb. per acre, and 100 lb. superphosphate 35 bushels 23 lb. per acre.

Seeding.

The average amount of seed used per acre when sowing the competition crops in the different centres of late years has been as under :—

Locality.	1924.	1925.	1926.	1927.
	lb.	lb.	lb.	lb.
Parkes	52	56	60	60
Forbes	59	58	58	66
Peak Hill	......	49	51	55
Tullamore	......	......	48	52
Trundle	50	49	52	52
Bogan Gate ...	......	56	57	55
Nelungaloo	......	......	......	59
Coradgery	51	57	53	53
Tichborne	......	......	......	56
Manildra	......	......	......	64

The average amount of seed now used in the west is about a bushel per acre; some centres have appreciably increased the seeding over that of 1926, as it has been found that better fallows allow denser crops to reach maturity. The value of graded seed, which is pure and true to type, is now well recognised, and very few crops below seed standard were submitted to the judge. High quality seed means an increase of at least 3 bushels per acre.

Seed Treatment.

The treatment of seed for bunt prevention for the past four years is indicated in the following table :—

Locality.	Untreated Crops.				Dry Copper Carbonate Treatment.				Wet Treatment.			
	1924.	1925.	1926.	1927.	1924.	1925.	1926.	1927.	1924.	1925.	1926.	1927.
Parkes ...	0	1	0	0	10	9	18	19	12	2	1	0
Forbes ...	3	1	0	0	1	11	13	10	14	3	1	0
Peak Hill ...	...	0	0	0	...	14	9	8	...	2	0	0
Tullamore ...	...	...	2	0	...	...	6	11	...	...	4	0
Trundle ...	2	1	1	0	10	9	21	13	10	4	3	0
Bogan Gate ...	...	0	0	0	...	11	8	11	...	7	2	1*
Nelungaloo ...	...	...	...	0	...	...	...	8	...	...	...	1†
Coradgery ...	0	0	0	0	9	6	5	7	2	0	0	0
Tichborne ...	...	...	...	0	...	...	..	6	...	...	...	0
Manildra ...	...	...	...	1	...	...	...	3	...	...	...	4‡
Totals ...	5	3	3	1	30	60	80	96	38	18	11	6

* Bluestone. † Formalin. ‡ Three crops formalin, and one a proprietary mixture.

Areas demonstrating the value of using the dry copper carbonate treatment were first established in the Farmers' Experiment Plots in 1923. At that time not one farmer was using the treatment. The results being satisfactory, it was adopted by some farmers in 1924, and the number of competition crops so treated in that and the following years was as follows :—

Year.	Total Number of Crops Exhibited.	Number of Crops Dry Treatment.	Percentage of Crops Dry Treatment.
1924	73	30	41
1925	83	60	72
1926	94	80	85
1927	103	96	93

The Varieties Used

The following table shows the number of crops of each variety exhibited at each centre in 1927 :—

Variety.	Parkes.	Forbes.	Peak Hill.	Tullamore.	Trundle	Bogan Gate.	Nelungaloo.	Coradgery	Tichborne.	Manildra.	Total.
Waratah	5⅝	7	2⅔	1⅓	3	3½	2½	2	1⅝	2	31⅜
Canberra	4½	1	2	1	2	3	4	...	1	...	18½
Federation	2½	...	0⅓	2⅓	2	1	...	1	0⅓	1	10½
Bena	3⅓	...	...	0⅓	2½	...	1½	...	0⅓	1	9
Turvey	...	...	2	2	0½	1	...	...	2	...	7½
Yandilla King ...	0⅓	...	...	...	1	...	...	3	...	2½	6⅚
Marshall's No. 3 ...	...	...	1	...	1	...	...	0½	...	1	3½
Hard Federation ...	...	...	...	...	...	2	...	...	...	0½	2⅝
Penny	...	...	...	2	...	...	...	...	...	...	2
Minister	...	1	...	...	...	...	...	...	...	...	1
Austin	...	1	...	...	...	...	...	...	...	...	1
Wandilla	1	...	...	...	...	...	...	...	...	...	1
Bogan	1	...	...	...	...	...	...	...	...	...	1
Lotz	1	...	...	...	...	...	...	...	...	...	1
Gluyas	...	...	...	1	...	...	...	...	...	...	1
Improved Purple Straw	...	...	...	1	...	...	...	...	...	...	1
Nizam	0½	...	...	...	...	...	...	...	...	...	0½
Improved Steinwedel	...	...	...	...	...	0½	...	...	...	...	0½
Corell's No. 8 ...	...	...	...	...	...	...	0½	...	...	...	0½
Gresley	...	...	...	...	1	...	1	...	0½	...	2½
Number of Varieties Exhibited at ...	9	4	5	8	8	6	5	4	6	6	61

The proportions in which certain varieties were exhibited in the competitions during recent years were as follows :—

	1924.	1925.	1926.	1927.
Canberra	28 per cent.	38 per cent.	23 per cent.	18 per cent.
Waratah	3·5 „	13·4 „	21·6 „	31 „
Bena	......	......	......	9 „
Federation	......	......	......	10 „

The placing of the varieties in the ten competitions in 1927 was as under :—

No. of times entered.	Variety.	1st.	2nd.	3rd
31⅗	Waratah	5½	4	2½
10½	Feder tion ...	2½	......	......
18½	Canberra	1	......	½
7½	Turvey	1	2	2
6⅗	Yandilla King ...	......	1	1
9	Bena	......	1	......
3½	Marshall's No. 3 ...	......	1	1½
1	Gluyas	......	1	......
½	Coroll's No. 8 ...	......	......	½
2½	Grosley	......	......	1
1	Lotz	......	......	1
2	Penny	......	......	1

With a total of 103 entries, twenty different varieties were submitted to the judges for inspection. The advantages to be gained from a reduction in the number of varieties are great, particularly from the aspect of pure seed supply, and the interests of the Bureau branches can well be directed towards eliminating the least desirable sorts.

The outstanding variety was Waratah, which comprised 31 per cent. of the crops exhibited, and scored five and a half firsts, four seconds, and two and a half thirds. Next came Canberra with eighteen and a half exhibits, taking one first and half a third. Unfortunately the September rains came just too late for the Canberra crops, and the heads did not fill well—an unusual happening for this variety. Federation was well represented with ten and a half of exhibits, and scored two and a half firsts. Federation seems to prefer the heavy soil, but the fallows on which it is grown should be well worked. Bena comprised nine of the exhibits and scored one second. Some crops of this variety were a little disappointing, and yet two excellent crops grown on heavy soils and well worked fallows were seen. This variety undoubtedly prefers the heavy soils, and can hardly be recommended for the more western portions of the district. Other varieties made up a large assortment, and it is with these that a weeding out process should commence.

Cultural Methods.

In the table below is shown the number of crops grown on fallowed and stubble land in each competition, and also the average number of times the fallow was worked in each locality. The ploughing of the fallow and

the drilling of the seed have not been included in the number of times the fallow was worked, but where the combined drill was used it has been counted as a working.

Locality.	Number of Crops Exhibited.	Crops on Fallow.	Crops on Stubble.	Average Number of Times Fallow worked.
Parkes	19	19	......	6·2
Forbes	10	10	......	4·5
Peak Hill	8	7	1	4·4
Tullamore	11	11	......	4·5
Trundle	13	13	......	4·6
Bogan Gate ...	12	12	......	4·7
Nelungaloo	9	8	1	5·9
Coradgery	7	6½	½	4·8
Tichborne	6	6	......	5
Manildra	8	7	1	4
	103	99½	3½	......

Of late years there has been a marked improvement in the working of the fallows, particularly as regards the number of workings. The following table shows the average number of times the fallow was worked in each competition:—

Locality.	1924.	1925.	1926.	1927.
Parkes	3·9	5·4	5·4	6·2
Forbes	3·5	4·0	4·9	4·4
Peak Hill	......	2·7	3·7	4 3
Tullamore	......	......	3·2	4·5
Trundle	3·0	3·7	2·9	4 6
Bogan Gate ...	......	3·0	4·5	4·7
Nelungaloo	......	......	......	6·0
Coradgery	3·5	2·7	2·7	5·1
Tichborne	......	......	......	5·0
Manildra	......	......	......	4·0

As many as eleven workings were given to one fallow, and several received eight to nine. With such a number almost ideal seed-beds can be produced, and the way paved for liberal seedings and manurings.

Diseases.

It is very evident that good farming is having a marked effect upon disease control. In the central western district crops were very free from all the wheat diseases excepting flag smut. Bunt may now be said to be eliminated from our crops, as only three ears of bunt were noticed during the whole of the judging; such a happy position must be credited to the dry copper carbonate treatment. Foot-rot and take-all were rarely met with, and then only in isolated plants or very small patches. Loose smut was occasionally

seen, but only as very light infections. Flag smut was the most serious disease of the year, for most crops showed some infection and many a considerable amount. Varieties such as Yandilla King and Gresley, which have proved in past years to be fairly resistant, were appreciably affected in places, probably due to seasonal conditions at the germination period. Some Canberra and Federation crops were badly infected. Nabawa, a new wheat, which has been growing in farmers' experiment plots, has again proved itself to be resistant, and is a likely looking grain wheat. Investigational work as to control measures is being continued by the Department.

Pure Seed.

The system of pure seed wheat supply established in the western district in 1924 is now on a firm footing, and has developed into a commercial project with many pure seed growers. The purity of the competition crops is largely due to the efforts of these men, and farmers are well advised to make full use of the seed so produced.

The Parkes Results.

The following table brings to light the main contributing factors in increased yields in the Parkes competitions of the past two years. The averages of the seven leading crops are compared with the averages of the next twelve crops, and the deductions made from the 1926 results are supported by the results of 1927.

	Average of Seven Leading Crops.		Average of next Twelve Crops.	
	1926.	1927.	1926.	1927.
Yield	38·6 bus.	28·6 bus.	29·25 bus.	20·8 bus.
Superphosphate ...	65 lb.	69·3 lb.	53·5 lb.	61 lb.
Seed	63 ,,	57·3 ,,	57·7 ,,	61 ,,
Fallow worked ...	6·6 times	8·4 times	4·75 times	4·9 times

The yield of the seven leading crops was 32 per cent. greater than the other twelve crops in 1926, and 37 per cent. greater in 1927. The outstanding factors giving such increase were :—

(1) The frequency with which the fallows were worked, and

(2) The increase in the amount of superphosphate used.

In 1926 the fallows producing the seven leading crops and the next twelve crops were worked 6·6 and 4·75 times respectively, an increase of 1·85 workings in favour of the successful crops. In 1927 the times worked were 8·4 and 4·9 respectively, an increase of 3·5 times in favour of the winners. The average number of workings of both sections in 1927 was greater than in 1926.

The use of superphosphate shows an increase all round, the amount being 69·3 lb. of high grade superphosphate per acre for the seven leading crops of 1927.

The amount of seed used remains fairly constant, being about one bushel per acre.

There is no doubt whatever that the frequent working of the fallows and the liberal use of superphosphate and seed are the main contributing factors in the production of the high yielding crops entered in the several crop competitions.

CENTRAL WESTERN DISTRICT.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

Despite the unfavourable season which prevailed throughout the central west in 1927 all the principal agricultural associations in the wheat-growing section of the district conducted competitions. The crops judged were of outstanding merit, and were in themselves evidence of improved farming methods, largely the outcome of these competitions.

The season, as regards rainfall, was one of the lightest on record, during both the fallow and the growing periods. It was most erratic, particularly in the Grenfell district, where crops west of the town either did not germinate or were very light, while to the south and east, in the Greenethorpe district and towards Young, very excellent yields (up to 36 bushels) were harvested.

Fallowing commenced mainly in July and August under very good conditions a dry spring following. In December and January very good falls were experienced, and farmers who took full advantage of them by putting the soil in the best condition to retain moisture, were well rewarded, for no heavy rain was recorded from then until the end of September. The sowing period was particularly dry, and great difficulty was experienced by most growers in sowing under conditions which would guarantee a good germination.

The growing period was very dry, and abnormally heavy and numerous frosts were experienced. By mid-September only about 3 inches of rain had fallen on the growing crop, and with the early advent of warm weather crop failures were imminent. However, at the end of the month heavy falls were experienced, and continued at intervals of a fortnight right up to harvest. The response of the wheat-crop to the change to favourable conditions was remarkable, and afforded evidence of the extreme hardiness of the wheat plant.

It was a season where the benefit of good fallowing methods was most noticeable. Firstly, the farmer with his fallow in good condition got a satisfactory germination, and secondly, the plant was able to withstand the hard dry winter months, not making much growth, but holding out, and with the advent of rain and warmth to grow rapidly to produce crops of from ten to thirteen bags per acre. On the other hand, crops on stubble or poor fallows had practically perished before the rain came.

The rainfall at centres where competitions were judged was as follows :—

	Grenfell.	Eugowra.	Cowra.	Cano-windra.	Molong.
	inches.	inches.	inches.	inches.	inches.
Fallowing period (July to March) ...	12·45	12·22	13·37	13·07	15·58
Growing period (April to mid-November).	9·64	8·42	9·98	9·13	10·14

Analysis of the Competitions.

The following competitions were judged :—

	Entries.
Grenfell P. A and H. Association Fallow and Crop Competition	22
Grenfell P. A. and H. Association Crop Competition ...	5
Cowra P. A. and H. Association Fallow and Crop Competition	10
Cowra P. A. and H. Association Crop Competition (Henley Cup)	19
Eugowra P. and A. Association Fallow and Crop Competition	5
Eugowra P. and A. Association Crop Competition	11
Canowindra P. and A. Association Crop Competition ...	15
Molong P. and A. Association Crop Competition	7
Cranbury Agricultural Bureau Crop Competition	8
Total	102

Points Awarded Winning Crops.

The winning competitors and the points awarded were as follows :—

FALLOW and Crop Competitions.

Society.	Competitor.	Variety.	Crop points.	Fallow points.	Total.
Grenfell ...	R. B. Black, Greenethorpe...	Waratah and Union	135	136	271
Eugowra ...	W. J. Bradford, Eulimore	Waratah	126	139	265
Cowra ...	F. C. Rowlands & Sons, Waugoola.	Waratah	136	141	277

CROP Competitions.

Society.	Competitor.	Variety.	Award points.
Grenfell ...	A. C. McColl, Koorawatha ...	Waratah	132
Cowra	F. C. Rowlands & Sons, Waugoola.	Waratah	136
Eugowra ...	R. H. Herbert, Trajere ...	Waratah	123
Canowindra ...	H. J. Balcombe, Toogong ...	Waratah and Yandilla King	130
Molong	Cole Bros. and Hyland, Molong	Turvey	126

Varieties.

Seventeen different varieties were included in the 102 blocks judged, and of these nearly 50 per cent. were Waratah. The following table shows the popularity of varieties and their success in the competitions judged :—

Variety.	Total entries.	First place.	Second place.	Third place
Waratah	48	8	4	6
Yandilla King ...	19	2	2	2
Bena	17	...	5	1
Turvey	9	1	...	1
Canberra	7	...	...	1
Union	3	...	...	...
Purple Straw	3	...	...	...
Marshall's No. 3 ...	2	...	...	...
Federation	1	...	...	...
Other Varieties ...	7	...	...	...

The outstanding feature is the popularity of Waratah, and the number of "places" it secured is evidence of its high qualities. It certainly demonstrates its ability to withstand dry weather, and to respond quickly in the later stages of growth to improved conditions.

Yandilla King, by virtue of its long maturity, was able to take full advantage of the late rains.

Bena showed to advantage where conditions were best. Generally speaking it was very short, most uneven, and suffered considerably from the adverse conditions.

The late rains benefited Turvey also, which did particularly well in the Molong and Canowindra districts.

It was a noticeable feature that only one block of Federation was submitted. This variety is undoubtedly being displaced completely by Waratah, Bena, &c.

Treatment for Bunt.

The treatment of wheat for bunt prevention was distinctly in favour of the dry copper carbonate process, as the following shows :—

			Per cent.
Crops treated with dry copper carbonate	...	=	93
,, ,, bluestone	...	=	5
,, ,, formalin	...	=	1
Crops not treated	...	=	1

The untreated block, two of those treated with bluestone and one treated with dry copper carbonate were the only ones in which bunt was noticeable. The block treated with copper carbonate which showed the disease was easily traceable to incomplete dusting. The many advantages of the dry method of treatment are now common knowledge among up-to-date wheat growers.

Quantities of Seed and Superphosphate.

The following table shows the average quantity of seed and superphosphate per acre used :—

	Grenfell.	Cowra.	Eugowra.	Canowindra.	Molong.	Cranbury.
	lb.	lb.	lb.	lb.	lb.	lb.
Seed per acre	62·0	57·7	61·4	63·7	61·3	63 0
Superphosphate per acre ...	67·0	60·0	64·3	62·2	57·0	61·2

The average quantity of both seed and superphosphate is steadily increasing each year. The winning blocks were all above the average in the quantities of both which were used, the Grenfell block having received 65 lb. seed and 95 lb. superphosphate while in the Cowra block it was 65 lb. seed, and 75 lb. superphosphate &c.

Cultivation Methods.

The average number of cultivations given to the fallows on the blocks occupying winning positions was seven. The times of first ploughing the fallow were :—

2	were commenced	in	June.
5	,,	,,	July.
7	,,	,,	August.
5	,,	,,	September.

The cultural details of the most prominent blocks in the central western competitions will be of interest :—

F. C. Rowlands and Sons, winners of Cowra Fallow and Crop Competition and Henley Cup. Bright red loams, originally timbered with yellow box. Disced after a burn in January; mouldboard ploughed September, turning under heavy growth of trefoil; harrowed September; springtoothed December and end of January; harrowed mid-March; springtoothed early May, and drill-sown and harrowed. This fallow won the Cowra Society's Competition in March, and was the best fallow yet judged by me in any competition. The crop was estimated to yield 35 bushels; it gained third place with 134½ points in the Royal Agricultural Society's Championship for the central south-west division.

R. B. Black, winner of Grenfell Fallow and Crop Competition and fourth place in central south-west competition with 134 points. Soil light red, sandy to grey loam; mouldboard ploughed August; harrowed September; springtoothed end October; disced January; harrowed March; combine sown and harrowed 24th and 25th May. This fallow was third in the Grenfell Fallow Competition. The crop was estimated to yield twelve bags.

W. J. Bradford, winner of Eugowra Fallow and Crop Competition. Medium red loam; mouldboard ploughed September; disced October; springtoothed January; harrowed February; springtoothed March; combine sown mid-May, and harrowed. The fallow won the Eugowra Fallow Competition, and the crop was easily the best in the district.

Trueness to Type.

The establishment of pure seed areas and experiment plots throughout the central west has given farmers an opportunity of securing pure seed. These competitions have demonstrated the value of growing from such seed, and it is unusual now to see badly mixed seed in competition blocks. The average points awarded in each district for trueness to type and purity were:—Grenfell 18·9; Cowra 18·8; Eugowra 18·5; Canowindra 18·3, and Molong 18·5.

Diseases.

The disease most in evidence this year was flag smut, the dry seeding period being no doubt largely responsible for this. Very few crops were entirely free from the disease, and the attack ranged approximately from 2 to 12 per cent.

Loose smut was very variable in its attack, and generally speaking was not severe; several crops were infected up to 8 or 9 per cent. They were of Canberra and Turvey varieties, both of which appear to be very susceptible to the disease. Foot-rot, take-all, septoria, and rust were encountered, but the attacks were mild.

Yields.

The yields obtained in crop competitions throughout the central west this year, when the weather conditions were so adverse, were remarkable. There is no doubt that under the same conditions ten years ago crop failures would have been much more general and the average yields very much lower. This can be attributed to the very great improvement in farming methods on the one hand, and the production of drought-resisting, hardy, high-yielding varieties on the other.

The following table affords an indication of the average yields in the central western competitions:—

Society.	Average yields of whole competition		Average yields of three placed crops.		Average yields of unplaced crops	
	bus.	lb.	bus.	lb.	bus.	lb.
Cowra	28	32	34	0	27	30
Grenfell	27	5	32	0	26	20
Eugowra	23	0	24	20	22	30
Canowindra	26	16	29	0	25	35
Cranbury	26	38	29	0	25	0
Molong	25	8	27	40	23	15

RIVERINA DISTRICT.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

The competitions covered in this report embraced the following districts :—Coolamon, Lockhart, Brookdale, Finley, Corowa, and Albury.

The season was in most parts one of the driest for over forty years. In many parts it was worse than the years 1902 and 1914. Some districts did not obtain as much rain as in 1902, and in 1914 there were fair autumnal rains to start the crops, dry weather setting in about winter and continuing through the spring. In the past season most places experienced a dry time right from October, 1926. The summer of 1926-27 was dry, and was followed (except for an occasional shower) by a dry autumn. There was a slight break in May, just sufficient to start things and give a germination of a sort. It then quickly dried again, and remained so right through the winter until the end of September, June being one of the most severe and dry experienced for some time, as many as twenty-six frosts being recorded in that month. The crops were tested to the utmost, and many were given up as hopeless but still they hung out. Most farmers stated that they had never before seen wheat tried out to such an extent, and they could not have believed it possible that it could have survived. The value of the 2 to 3 inches of rain that fell at the end of September and the beneficial manner in which it fell was incalculable.

The district along the river Murray from Howlong and in the immediate vicinity of Albury, and for a short distance up the Main Southern Line and across to Holbrook experienced much more favourable conditions than others. In the vicinity ot Albury good rains were experienced throughout August, but this quickly petered out a few miles away, and dry conditions were experienced at Jindera, Walbundrie, Burrumbuttock, Brocklesby, Moorwatha, &c. At these and more distant places less than half the average rain was experienced for the year up to the end of September.

An estimation of the yields was made at judging time (shortly before harvest) and showed the probable yields to be as follows:—In most of Eastern Riverina, almost up to normal standard; in the central, south-west, and western Riverina from a two-third to a half crop on the average, with practically no failures on decently fallowed land. It was only beyond 12 miles west of Deniliquin that many failures were seen, and most of this country is black soil, comparatively new, and had had only up to 3 and 4 inches of rain up to the end of September.

The results have been a triumph for present day farming methods over very severe drought conditions, and have shown how long wheat will hold out and to what an extent it will recover, given a sound foundation.

Had the farming conditions of 1914 and earlier years been in vogue generally over the Riverina to-day, it is probable that this year's harvest would have been more disastrous than that of 1914.

It speaks well for the value of crop competitions that under conditions such as these there was only one society which did not conduct the usual competition this summer (and in that case withdrawal was not on account of seasonal conditions), while two new competitions were commenced. In most cases there was actually an increase in the number of entries, and greater enthusiasm and interest than ever.

The following is the summarised rainfall in two periods, showing total rain up till the 28th September, the total rain for the year, and the average over a number of years.

District.	Rain up to 28th September, 1927.	Total for Year 1927.	Average.
	Points.	Points.	Points.
Coolamon	650	1,250	2,005
Lockhart	745	1,225	1,825
Finley	450	1,050	1,625
Corowa	833	1,175	2,100
Albury	1,510	2,073	2,780

The soils of the Coolamon, Lockhart, and Albury districts, are fairly uniform, being mostly red loams. A few in the Albury district are of a heavier, slightly silty nature, and run together if worked too much, but this district usually has a much heavier rainfall than any of the others.

The soils of the Finley district are mostly of a heavy red clay loam nature, the majority being box country, but a good many sandy pine and stiff black boree patches of considerable size occur, making rather a mixture.

Corowa soils also are rather mixed. A good deal of the soil is similar to the heavy silty types round Albury, but there are patches of considerable size of a heavy black boree type, which are inclined to be self mulching. These latter types of soils should make excellent wheat lands, but they require first a considerable amount of attention. There are considerable areas of a similar type some miles out of Lockhart on the Brookong Plains.

The particulars collected at judging time regarding the cultivation methods of the various blocks summed up, afford interesting and useful information. Summarised tables showing the cultivation methods, seeding, &c., and the resultant yields are shown below. The season was an excellent object lesson of the best of present day methods of fallowing, and an answer to "Does fallowing pay ?" has been demonstrated to every farmer in every district as never before. The fallows were of a considerably better standard than previously, and in most parts the crops were demonstrative of the class of fallow upon which they were on. There were one or two exceptions, but these could generally be accounted for. For instance, an excellent fallow in the Coolamon district did not produce the crop that was expected of it owing to being sown too deeply. The soil was rather of a sandy nature, and the surface crusted after an abnormally heavy isolated storm. The

soil then dried up rapidly, and a good deal of the crop could not get through, while a little of the seed also went mouldy. A good deal of this occurred in the various districts this year.

It has always been advocated that it is best to sow shallow when forced to sow dry, and this was demonstrated to farmers' losses in many parts. The crop referred to in the Coolamon district was improved considerably by a vigorous harrowing, and ran into third place even then.

A good many blamed the combine for the deep sowing, but nearly all the winning crops in every district were sown with the combine, and it is thought that it was not so much the fault of the weighty machine as of loose seed beds. The use of the combine is rapidly on the increase, and it appears to be giving excellent results.

In the Corowa district a crop on the leading fallow showed rather disappointing results. The seed of this was pickled with formalin. Grain treated with formalin requires to be sown soon after treatment under excellent germinating conditions, or damage is done to the grain. To make matters worse, the amount of seed sown per acre was light, and especially so for this dry season. Consequently the strike of the crop was very light. It was an early maturing variety, which does not stool much, and this factor did not help the other two. The bluestone treatment also had similar results. It was noticed that a good deal of the bluestone-treated seed went mouldy.

The dry copper carbonate treatment of seed has rapidly increased, and it is now almost unusual to come across seed treated by other methods. There is no doubt that the modern dry copper carbonate method of pickling wheat has added bushels to the average farmer's yield this season. No bunt was seen in crops that had been efficiently dry pickled, but bunt was seen in several crops that had been treated with bluestone or that had had no treatment.

It has been advised that under dry seeding conditions, farmers should sow late, sow heavy seed and superphosphate, sow shallow, and dry pickle and the past season has demonstrated these recommendations on every hand.

Earlier ploughing is rapidly gaining favour, and almost every winning crop in every district was June or July, ploughed. It was noticed that the further west and the earlier the ploughing the better results. Quite a considerable attention has now been paid to summer fallowing preceding the winter ploughing and other things being equal, this is showing excellent results. Experiments have shown over a number of years that on the average 2 bushels more per acre are obtained with June ploughing than with August ploughing, and the competitions are bearing this out. It has often been said that in the Albury and Henty districts it is usually wet, and August ploughing gives better results, or that it is usually too wet to plough till then. Still the competitions show that in many cases the winning crops were sown on

land ploughed in June or July. In wet districts it is thought that a good deal depends on the manner of the after cultivations of the fallow, and that in these districts the mulch can be rougher and deeper.

Two fallows were entered in the Coolamon Competitions by the same farmer one being disced in January and the other being scarified with the duckfoot. The crop on the former area yielded 18 bushels per acre and that on the latter 25 bushels per acre. Other conditions were equal. This speaks for itself.

The working of the fallow is now receiving considerably more attention, and farmers generally are sowing smaller areas and working the fallows a greater number of times. Except in the Albury district, where conditions are usually more favourable, the leading crops were on fallows that had been worked five and six times, and in the drier districts such as Finley they were worked seven and eight times. This is not counting ploughing or seeding operations, which is usually done with the combine.

The benefits of good pure seed have been taken much more seriously the last two years. There is still room for considerable improvement in the Finley, Corowa, and especially the Albury districts. Lockhart district had easily the best proportion of pure seed. It was noticed that this applied in those districts that had had the experiment plots for some time.

The following is the proportion of pure seed crops, or crops that scored nineteen for trueness to type :—Lockhart 77 per cent., Coolamon 70 per cent., Finley 59 per cent., Corowa 43 per cent., and Albury 19 per cent.

It was noticed that Federation was particularly an offender in this respect.

The rate of seeding and manuring have both been steadily on the increase of recent years, with more beneficial results each year. The leading crops in each district were seeded at about 70 lb., and manured with about 90 lb. superphosphate. It was noticed that both these factors can be overdone, while there are still many who seed 60 lb. and below, with superphosphate about the same. These latter were nearly always "share" crops. The majority of competitors sowed about the quantities mentioned earlier.

Of the diseases, there was very little foot-rot or take-all, but an over supply of flag smut. This last fungus caused losses of up to 30 per cent in many cases. A good summer burn, followed by an early summer cultivation and a rotation of oats where possible, is particularly desirable this season. Dry pickling has practically eliminated bunt.

Of the varieties, Federation, Waratah, Turvey, and Yandilla King were most popular. Yandilla King finished well, and is slowly but surely taking the place of Turvey. Marshall's No. 3 did very well, but pinched a good deal towards the last—more so than Yandilla King. Canberra had a good deal of flag smut, but filled up its grain better than Waratah. A good deal of the Waratah ripened off prematurely and pinched somewhat. Major

and Penny seem to suit certain parts, and showed some good results this year. The most promising of the new wheats were Bena, Gallipoli, Wandilla, and Union, particularly the last named.

There is no doubt that a combination of early ploughing, increased working of the fallows, increased amounts of seed and manure (which go hand in hand with the two former factors), plus dry pickling, have gone a long way towards securing a moderately successful harvest in one of the worst seasons for forty years.

Brookdale was a very small competition, having only three entries in the single 50-acre crop, and being within 15 miles of Lockhart it has been included with the particulars of the latter district.

SUMMARY of Cultural Operations of Riverina Crop Competitions.

Society.	Number of entries judged.	Number ploughed. June July or earlier.	Number ploughed. August-September.	Average No. of workings between ploughing and seeding.	Crop sown with Combine.	Crop sown with Hoe Drill.	Crop sown with Disc Drill.	Average quantity of seed applied.	Average quantity of superphosphate applied.	No. pickled with Dry copper carbonate.	No. pickled with Bluestone.	No. pickled with Formalin.	Not pickled.	Average yield of competition.	Average yield of first three crops.
								lb.	lb.					bus.	bus.
Albury ...	21	10	11	2½	13	6	2	69½	77	18	...	1	2	29½	33½
Corowa ...	21	8	13	3¼	11	8	2	68¾	77½	14	4	1	2	22¾	27⅔
Coolamon ...	35	29	6	3	31	3	1	70	75	34	1	...	...	20	28
Lockhart ...	18	11	7	4	12	5	1	66	69	18	...	...	...	21¾	27⅓
Finley ...	17	10	7	5	15	2	...	65	71	14	2	...	1	18	21⅔

VARIETIES used in Riverina Crop Competitions.

Variety.	Number of entries.	Number of Places. First.	Second.	Third.
Waratah	40	2	3	2
Turvey	22	1	...	...
Federation	17	1	1	...
Yandilla King ...	15	2	1	...
Bomen	9	1	...	3
Bena	8	...	1	...
Marshall's No. 3 ...	6	...	...	...
Wandilla	4	...	...	...
Major	3	...	...	...
Canberra		...	...	...
Union		...	...	...
Meridan	2	..	...	...
College Purple ...	1	...	...	...
Aussie	1	...	...	...
Baroota Wonder ...	1	...	...	...
Gallipoli	1	...	...	...
Pusa	1	...	...	...
Austin	1	...	...	...
Wannon	1	...	...	...
Hard Federation ...	1	...	...	...

THE SOUTH-WESTERN DISTRICT.

G. NICHOLSON, H.D.A., Agricultural Instructor.

Crop competitions were organised by six local agricultural societies, viz., Young, Ariah Park, Ungarie, Barmedman, Cootamundra, and Illabo. Taking into account the not entirely favourable season, the support afforded the Young, Ariah Park, and Ungarie societies by competitors was very satisfactory. The number of entries received in the other competitions was not encouraging. Illabo, on account of its geographical situation, has practically decided to withdraw its support from crop competition activities, and this season the competition was held mainly with the idea of finalising matters for a silver cup. Hence the limited number of entries.

Throughout the more favourably situated sections of the district many excellent crops well up to competition standard were noticed. It is to be regretted that owners of such crops did not participate in the competition, and thereby support their own local society in a worthy effort to stimulate better farming methods. By so doing, they would have assisted to make the competition a success, not only in point of numbers, but also from an instructional and educational standpoint. In the territory under review considerable variation in soil and climatic conditions occurs, and had crops representative of each section been entered considerably more information would have been collected as a result of the competition. One of the principal objectives of the competition is to demonstrate to farmers in a practical manner the best methods by which they may hope to increase the productivity of the soil. That a careful study of local conditions and the adoption of up-to-date methods of farming will give payable results is evidenced by the fact that some competitors are often successful in filling a winning position season after season.

The Season.

Although dry years are by no means unheard of, it is seldom that a season such as the past is experienced. It will be remembered mainly on account of the remarkable recovery made during the spring months. It was a season in which up-to-date farming methods, combined with careful judgment, correct seeding, and the judicious use of superphosphate stood out prominently in comparison with slip-shod methods.

For the twelve months ending August, 1927, the rainfall was light and patchy, ranging from 849 points at Ungarie to 21.09 points at Young. In many instances fallowing was delayed because of the sodden condition of the land during the winter of 1926. Many soils packed down tightly and dried out rapidly, thus making ploughing of the fallow difficult. Dry weather continued until late autumn, consequently it was difficult to have the fallows in first-class order by seeding time.

In the aggregate the rainfall was sufficient for the production of fair to good crops; however, the incidence was anything but favourable, hence many poor crops on fallows which had been neglected. From April until the latter portion of September only light, scattered showers, interspersed with frequent and heavy frosts, were experienced. During that period Ungarie registered 315 points and Young 730 points. For the effective growing period—April to October, inclusive—the rainfall ranged from 679 points at Ungarie to 1,047 at Young. The absence of the customary steady soaking winter rains, in combination with the dry condition of the fallows, made the outlook anything but promising. In fact, many farmers had given up all hope of a harvest, and sheep had been turned in to graze off the crop before it had completely burnt off. By late September the position looked almost hopeless, but fortunately at that time copious and widespread rains of a soaking

Waratah Wheat on W. J. Cou[illegible]on's Farm at Murrumburrah.

This crop, together with a block of Bena, was the winner in the Young and Murrumburrah competitions, and runner-up in the R.A.S. Championship.

nature were received, and throughout October and early November further timely showers were recorded. These rains had the effect of transforming many crops which were regarded as failures into two- and four-bag crops, and others more favourably situated from four- and five-bag crops to nine- and eleven-bag crops. In the earlier sections many crops were too far advanced to derive full benefits from the later rains, but those situated in the later districts were still capable of utilising the moisture to the fullest extent. Some crops in the earlier districts, which made very heavy second growth and promised well, failed to fill on account of the hot, scorching winds which prevailed prior to harvest.

RAINFALL—April to October, inclusive.

Young, 1,047 points.	Ungarie, 679 points.	Cootamundra, 1,125 points.
Ariah Park, 884 points.	Barmedman, 817 points.	Illabo, 979 points.

The Varieties Used.

In the 106 blocks judged, seventeen different varieties were used by competitors. The following tables indicate the number of entries of each variety, and the winning position (if any) of same:—

Society.	No. of Entries.	No. of Varieties.	Maximum Yield.	Average Yield.
			bus.	bus.
Young	37	11	39	25·00
Ariah Park	35	10	28	20·40
Ungarie	11	5	19	12·27
Barmedman	11	6	33	25·36
Cootamundra	8	4	31	22·75
Illabo	4	3	31	27·27

Variety.	No. of Entries	Firsts	Seconds	Thirds.
Waratah	40	7½	2	4½
Turvey	29	...	2	1
Yandilla King ...	21	1	3½	3½
Marshall's No. 3 ...	6	1	...	...
Bena	6	½	½	...
Canberra	4	...	1	...
Federation	2	...	1	...
Gresley	3	...	...	...
Purple Straw	2	...	...	...
Wandilla	2	...	...	...
Gallipoli	2	...	...	...
Bomen	1	...	...	...
Baringa	1	...	...	..
Penny	2	...	...	..
Nabawa	1	...	...	...
Bungowanna	1	...	...	...
German Wonder ...	1	...	...	...

AVERAGE YIELDS of Principal Varieties.

Variety.	Young.	Ariah Park.	Ungarie.	Barmedman.	Cootamundra	Illabo
	bus.	bus.	bus.	bus.	bus.	bus.
Waratah	(13) 27·54	(13) 21·25	(6) 14·91	(3) 31·7	(3) 18·7	(2) 25
Turvey	(7) 22·0	(13) 18·45	(3) 10·0	(4) 24·0	(2) 19·5	...
Yandilla King ...	(9) 26·80	(7) 21·57	...	(2) 21·5	(2) 28·0	(1) 30
Marshall's No. 3...	(4) 22·0	...	...	...	(1) 31·0	(1) 20
Bena	(5) 25·8	(1) 16·0	...	...	...	...
Canberra ...	(2) 26·0	...	...	(2) 26·0	...	...

The figures in brackets indicate the number of entries.

Of 124 entries which came under review, no less than forty or 32 per cent. were Waratah. This variety featured in fifteen placed blocks, which represents 48.3 per cent. of the winning positions. Although Waratah shells rather freely in rough weather and the fine straw when well grown tends to tangle easily, its popularity is on the increase in both very early and late districts. When sown at the correct time it appears to be adaptable to

almost every soil and climatic variation met with throughout the district. Turvey and Yandilla King were well represented and gave excellent returns. Other popular varieties which acquitted themselves well were Marshall's No. 3, Bena, and Canberra. Competitors as a whole confined their selection to well-known standard varieties, and the six already mentioned comprise 88 per cent. of the entries. The remaining 12 per cent. was split up between eleven other varieties, all with the exception of Baringa, German Wonder, and Bungowanna (which resembles Turvey) being well known, and suited in varying degrees to local conditions.

Because of the light winter rainfall and the copious late spring rains the season tended to favour the late maturing varieties, and in the aggregate these gave the best returns. Quick growing varieties sown early were disappointing. There is a tendency on the part of some growers to sow early-maturing varieties far too early; particularly does this apply to the later districts. To quote one instance in the Young district—Waratah sown late in May actually stripped over 40 bushels per acre, whereas the same variety sown five weeks earlier under practically identical conditions stripped slightly better than half that amount.

Seed Treatment.

Copper carbonate as a means of effectively controlling bunt is well known, and its use by competitors was almost universal. Of the 106 crops under review, 102 were dry pickled with copper carbonate, one with bluestone, two with formalin, and one farmer neglected to pickle. Bunt was detected in two crops only. In both instances the seed had been dry pickled, but it was admitted by the owners of the crops that the failure of the copper carbonate to control the disease was due to faulty functioning of the pickling machine, which failed to give the seed coat a thorough dusting.

Rate of Seeding and Trueness to Type.

The greater number of competitors are fully alive to the value of pure seed. However, while many of the crops exhibited were of excellent type and purity, others again showed that little attention had been paid to seed selection. With three exceptions all competitors used graded seed.

Heavy seeding on well-worked fallow, combined with a favourable rainfall, was an advantage. However, when these conditions were reversed many crops tended to be over-crowded, the straw being weak and spindly.

Society.	Rate of Seeding.			Superphosphate.		
	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.
	lb.	lb.	lb.	lb.	lb.	lb.
Young	71	58	61·4	80	30	57·2
Ariah Park ...	80	40	63·8	100	40	80·0
Ungarie	70	55	60·0	80	40	63·0
Barmedman ...	80	50	72·0	100	58	81·6
Cootamundra ...	80	60	66·25	90	60	71·25
Illabo	70	60	67·5	90	35	70·0

Superphosphate was used by all competitors. On well-worked fallow the extra expense incurred by heavy applications was handsomely repaid by the increased yields obtained. During the dry period of the season crops heavily fertilised were most outstanding, being more vigorous and apparently capable to a greater degree of resisting disease. Experiments in the Young district indicate that heavy applications of superphosphate are a payable proposition, and growers are recommended to increase their rates accordingly.

Cultivation.

In the combined crop and fallow competitions, winning fallows were well to the fore, and in two competitions out of four the winning fallows grew the crops which competed in the championship. The benefits accruing from some good fallows were nullified owing to poor judgment being exercised at seeding time. All crops were sown on fallowed land, the time of ploughing ranging from March to December; 53 per cent. were fallowed in July, 19 per cent. in August, 15 per cent. in June, and 6.5 per cent. in September. For fallowing, the mouldboard plough was most popular, 90 per cent. of competitors using it, 5 per cent. the disc plough, and 5 per cent. the disc cultivator or scarifier. The depth of ploughing ranged from 3 inches in the drier districts to 5½ inches in the moister districts—3½ inches to 4½ inches being most in favour. Numerous competitors worked the fallow with the springtooth or scarifier to the full ploughing depth during the early spring, and cultivated (shallow) again prior to harvest. The disc cultivator was distinctly out of favour.

Diseases.

The incidence of bunt has already been dealt with. Foot-rot and take-all were detected in a number of crops, and with one exception did not assume any serious proportions. Both flag smut and loose smut were prevalent, the former being responsible for a greater reduction of yield than all other diseases combined. Loose smut was far too prevalent in some crops, particularly Turvey. Seasonal conditions favoured heavy infection of flag smut. Most crops were affected, and in one the reduction in yield was estimated to exceed 35 per cent. Owing to the absence of the early autumn rains and the low winter rainfall germination was protracted and subsequent growth slow. The wheat seedlings were suffering from lack of vigour, and the flag smut spores germinating at the same time, they gained control. Of the better known varieties, Yandilla King showed greatest resistance, while Turvey, Marshall's No. 3, and Canberra appeared to be very susceptible.

BARELLAN, ARLETHAN, MURRUMBURRAH, AND BOOROWA.

E. B. FURBY, H.D.A., Agricultural Instructor.

It would perhaps be difficult to find a more unfavourable season than the one just past for the exhibition of well-grown crops suitable for competition purposes. Following on one of the driest winters experienced for

many years, when the spectre of total failure of the crops was imminent, the fact that competitions could be conducted with crops of very fair average yields showed what a wonderful recovery was made as a result of the beneficia rains in the spring. A very striking demonstration of the wheat plant's tenacity of life was afforded in many parts, when crops given up as apparently dead took fresh life and matured grain that fully warranted the cost of harvesting.

Judging, it will be seen, was done in two distinct localities—Barellan and Ardlethan on the one hand, and Murrumburrah and Boorowa on the other. Normally there is a big difference in the climatic and rainfall conditions of these two localities. The former places suffered to a considerable extent from the absence of suitable rains at sowing time and afterwards, while the latter places suffered to only a minor extent from this cause; in fact, in isolated places in these two districts cloud bursts were responsible for washing seed out of the land.

The following table gives the effective rainfall on fallow and crop at the different places; and although it would appear that the totals in each case were more than sufficient to grow a crop of wheat, the incidence of the individual falls, as far as Barellan and Ardlethan were concerned, was not adequate to maintain the crops :—

RAINFALL.

On Fallow.				On Crop.			
	Murrumburrah.	Barellan.	Ardlethan		Murrumburrah.	Barellan.	Ardlethan.
	pts.	pts.	pts.		pts.	pts.	pts.
June ...	464	202	233	April ...	55	39	39
July ...	119	133	132	May ...	237	34	124
Aug. ...	219	171	158	June ...	100	50	48
Sept. ...	136	43	99	July ...	144	117	122
Oct. ...	101	99	133	Aug. ...	146	78	76
Nov. ...	371	15	19	Sept. ...	143	117	124
Dec. ...	22	149	113	Oct. ...	193	227	361
Jan. ...	220	47	12	Nov. ...	338	...	...
Feb. ...	58	34	28				
Mar. ...	...	...	...				
Totals ...	1,710	893	927	...	1,356	662	894

At Boorowa there was a total rainfall on the growing crop of 1,050 points.

One of the greatest factors contributing to the partial failures of last season, apart from the low rainfall on the crop, was the extremely dry condition of the fallows at sowing time. From the commencement of fallowing till seeding the fallows did not receive a thorough soaking, except in isolated localities, where some fallows were exceptionally good as far as moisture was concerned. When the fallows were judged in March, moisture content was low, and at that time there had been only a poor strike of weed seeds.

These came later in the season, and were reflected in the appearance of the crops. The necessity and effectiveness of fallowing was amply demonstrated in each district.

The Working of the Fallows.

In such districts as Barellan and Ardlethan, where the rainfall is not so assured as farther east, too much importance cannot be placed on the necessity of sowing only on well worked fallows. It is fairly apparent at these two places that a gradual improvement is taking place in farmer's fallowing methods. Ploughing is being done earlier, and cultivation is being carried out more systematically. Owing to the nature of the past fallowing season and the absence of weed growth, workings were few, averaging three per fallow. With few exceptions all fallows carried sheep.

Varieties of Wheat Used.

The popularity of the varieties in each centre is shown in the following table :—

Varieties used.	Barellan.	Ardlethan.	Murrumburrah.	Boorowa
Waratah	7	7	6	2
German Wonder ...	...	3	...	...
Turvey	5	3	...	1
Major	...	1	...	...
Federation	3	2	...	...
Yandilla King ...	5	1	5	2
Marshall's No. 3 ...	...	...	5	3
Bena	3	...	3	...
Canberra	...	...	1	...
Penny	2	...	1	...
Bomen	7	...	...	...
Gresley	2	...	...	...
Currawa	1	...	...	...

In the Murrumburrah district, Bena, a comparatively new variety, is getting a firm hold, and is grown by some settlers in preference to Waratah for late planting, although Waratah remains a strong favourite. Late varieties do well in this district, as shown by the number of Marshall's No. 3 and Yandilla King crops. Penny, however, is giving good results here, and is attracting attention as a good yielder.

At Barellan, and to a certain extent at Ardlethan also, there is a growing dislike for Bena, Waratah, and Canberra, on account of their susceptibility to flag smut. During the past few seasons, it is stated, flag smut has taken a big toll of crops in the vicinity of Binya. It was again bad this past season.

An outstanding feature of the varieties is the general popularity of Waratah, and the number of entries of Bomen at Barellan, where it is claimed that no difficulty is experienced in disposing of the " red " grain, and that the extra yields obtained more than compensate for any dockage. The disease resistance of this variety, and its ability to produce grain under very adverse conditions, makes its elimination very difficult.

Seeding and Seed Treatment.

As a whole little fault could be found with the purity of the crops. The use of ungraded seed was the exception. Grading in many cases only meant, of course, re-machining, but actual grading was in general use. The importance of using pure graded seed was generally realised, though not always practised. Renewing seed from Government institutions, both within and without the State, was quite a common practice in each district, the result being reflected in the greater purity and trueness to type found in the crops.

The use of dry copper carbonate for bunt prevention can be said to be universal, the ease of its application and its effectiveness being rarely questioned. Where it has failed, the cause can invariably be attributed to either inferior pickling machines, or to slipshod methods of using it. On one farm the seed was not treated with any pickle because the seed was "bleached," and reckoned to be immune from bunt. There was, however, about a 10 per cent. infection of bunt in the crop. The use of dampers on pickling machines, though rendering the operation more agreeable to those using it, reduces the efficiency of the pickle.

Considerable variation existed in the rate of sowing and its ultimate effect upon the crop. There is a growing tendency to use more seed, exceeding the bushel per acre. It will be seen from the third table that the four leading crops in the four competitions were all sown, with but two exceptions, at from 60 to 80 lb. per acre. The winning crop of Federation at Ardlethan, estimated to yield 25 bushels, was sown at 45 lb. per acre, but it had the density and appearance of a crop sown at least at 60 lb. per acre.

The general rate of sowing varied from 45 to 90 lb., with an average of 65 lb. per acre, but it cannot be said that the higher rate this season was superior to a moderate seeding.

In view of the dryness of the season and the uncertainty of obtaining a germination, many crops were spoilt by being sown too deeply, resulting in patchy strikes.

The placing of the varieties in the competitions, together with the rates of seeding and manuring, is shown in the following table:—

	First place.		Second place.		Third place.		Fourth place.	
	Seed.	Superphosphate.	Seed.	Superphosphate.	Seed.	Superphosphate.	Seed	Superphosphate.
Barellan ...	Turvey—		Currawa—		Bomen—		Turvey—	
	60 lb.	90 lb.	55 lb.	90 lb.	65 lb.	70 lb.	60 lb.	85 lb.
Murrumburrah ...	Bena and Waratah—		Yandilla King—		Marshall's No. 3—		Waratah and Bena—	
	65 lb.	80 lb.	65 lb.	50 lb.	60 lb.	60 lb.	62 lb.	50 lb.
Ardlethan ...	Federation—		German Wonder—		German Wonder—		Yandilla King—	
	45 lb.	85 lb.	70 lb.	90 lb.	80 lb.	90 lb.	45 lb.	85 lb.
					Federation—		Turvey—	
					60 lb.	100 lb.	60 lb.	60 lb.
Boorowa ...	Marshall's No 3.		Waratah—		Marshall's No. 3.		Waratah—	
	69 lb.	40 lb.	69 lb.	40 lb.	69 lb.	90 lb.	69 lb.	90 lb.

Fertilisers.

The rate of application of superphosphate varied from 45 to 100 lb. per acre, with an average of 60 lb., there being a tendency towards higher amounts as with the seed, only with more outstanding results. This was a season when irregularities in the application of superphosphate were very apparent, strips left unmanured in a paddock standing out prominently, being considerably later and poorer than where the manure had been applied.

Diseases.

With a couple of exceptions, all crops were free from bunt, and generally very little take-all or foot-rot was found in any of the centres judged. Flag-smut, however, could be found in almost any variety, being particularly bad in Waratah and Bena in the Barellan and Ardlethan centres, but comparatively free at Boorowa and Murrumburrah. Apparently the autumn rainfall of these two places did not favour the development of this disease.

FURTHER RIVERINA CENTRES.

H. J. DARGIN, Agricultural Instructor.

Competitions conducted by five local agricultural societies in the Riverina (Narrandera, Berrigan, Oaklands, Culcairn, and Henty) were judged by me.

The Season.

The extreme western portion of the Riverina had suffered from droughty conditions to a great extent, and although some fine crops were inspected the majority could not be expected to be equal to those seen in better seasons. Narrandera, Berrigan, and Oaklands districts experienced very dry conditions during most of the fallowing period, and practically throughout the growing period. Fallowed ground did not receive the usual number of cultivations in these parts owing to it being too dry to work. The fine crops entered by Messrs. R. and A. Goodin, Narrandera, H. B. Webb, Berrigan, and D. Munro, Oaklands, and by the entrants who ran them closely for the honour of becoming the finalist in these districts under such seasonal conditions, speak volumes for the methods of cultivation adopted. Throughout these districts only 5 to 7 inches of rain fell during the growing period, and most of this fell late in September and early in October. At that time the prospects of obtaining payable yields in these localities were anything but bright, but the manner in which the wheat plants responded at this stage was extraordinary, and yields far beyond expectations resulted. A noticeable feature was the strong growth made and the manner in which the crops headed on the sandhill country, as compared with other types of soil in the Narrandera district, and on wheat fields where plants had become firmly established on well-fallowed land. The districts further east (Culcairn and

Henty) experienced much more favourable seasonal conditions and the harvest there is expected to be at least equal to that of last year. Many fine crops were seen in these parts other than those entered in the competitions.

It is well recognised that much can be learned from the experiences gained in these competitions during unfavourable seasons. On this occasion all first placed crops were grown on old cultivation land, and fourteen out of the fifteen placed crops in the five districts visited had been grown on old cultivation paddocks, many of which had grown crops for twenty to forty years, and in one instance (the winning crop at Henty) the land was broken up fifty years ago. This farmer has been a strong supporter of the wheat competition movement since its inception, and the knowledge obtained through this source is reflected to a great extent in the number of splendid crops seen on this farmer's property. Experience and knowledge obtained through close association with the scientific side of wheat farming for which these competitions are mainly responsible, has once again come out on top.

The number of crops judged were—Narrandera 27, Berrigan 23, Oaklands 20, Henty 22, and Culcairn 11; total, 103.

There were eighteen different varieties included in the 103 crops inspected, the most popular variety being Waratah, of which there were thirty-four and a half entries. Waratah is still very popular with growers in these districts, although the past season was not so suitable to it as previous seasons have been, as it showed a strong tendency to shell and in many places where it grew to any great height the fine straw tangled considerably, and a loss of points resulted where competitions were concerned.

Yandilla King yielded well under favourable conditions, while Federation Bomen, Penny, and Turvey, stood up to the droughty conditions and filled the heads well in places where under 6 inches of rain fell during the growing period. There were approximately three time as many entries of Waratah as of any other variety, and eighty-three out of a total of 103 entries were made up of the six varieties mentioned.

Varieties.

The following table shows the number of entries of each variety, and the places they filled in the competitions judged:—

Variety.	Total Entries.	First Place.	Second Place.	Third Place.
Federation	13½	2	½	...
Waratah	34	1	1 & 2 halves	2
Bomen	7½	1	...	...
Nabawa	1	1	...	...
Marshall's No. 3	2	...	1½	...
Turvey	13	...	1	1
Graham	2	...	...	1
Penny	12	...	...	½
Hutchins Early Purple	½	...	...	½

Seed Treatment.

The following table illustrating the seed treatment in the various districts shows the manner in which the farmers have adopted the method of dry dusting with copper carbonate for the prevention of bunt. Of a total of 103 crops inspected, eighty received dry treatment, nine wet treatment, and fourteen were untreated.

District.	No Treatment.	Wet Treatment.	Dry Treatment.	No. of Entries.
Narrandera	7	1	19	27
Berrigan	...	...	23	23
Oaklands	1	5	14	20
Henty	3	1	18	22
Culcairn	3	2	6	11
Total	14	9	80	103

Amount of Seed.

The various quantities of seed sown per acre in the different districts were as follows:—

District.	50–56 lb.	60–65 lb	70–75 lb.	80–85 lb.	90 lb.	Entries.
Narrandera	2	14	8	...	3	27
Berrigan	...	13	10	...	...	23
Oaklands...	3	12	3	1	1	20
Culcairn	1	4	4	1	1	11
Henty	1	4	12	5	...	22
Total	7	47	37	7	5	103

With but two exceptions, the placed crops in the five competitions were sown at the rate of 70 lb. or more per acre, and in only three cases was high-grade superphosphate applied at a lower rate than 70 lb. per acre. The following table illustrates the manner in which the heavier applications of seed and superphosphate proved advantageous in a season like the past, and the high percentage of placed farmers in the competitions who adopted this practice:—

District.	Place in Competition.	Seed per acre.	Superphosphate per acre	Variety.
Narrandera	1	60	56	Bomen.
	2	70	112	Waratah and Federation.
	3	90	135–140	Waratah.
Berrigan	1	70	72	Nabawa.
	2	70	70	Turvey.
	3	65	60–75	Graham.
Oaklands	1	90	110	Federation.
	2	85	85	Waratah.
	3	70	75	Waratah.
Culcairn	1	75	112	Federation.
	2	75	112	Marshall's No. 3 and Waratah.
	3	70	60	Hutchin's Early Purple and Penny.
Henty	1	80	90	Waratah.
	2	75	75	Marshall's No. 3.
	3	70	70	Turvey.

Attention should be paid to obtaining pure uninfected, graded seed, as there were altogether too many strangers, and signs of seed running out were apparent in a number of crops. Attention should also be given by farmers whose country has become badly infected during the past season to the selection of varieties showing strong disease-resistant qualities.

Superphosphate.

The following table shows the quantities applied per acre to all crops in the five districts visited:—

	45 lb.	50–60 lb.	60–65 lb.	70–75 lb.	80–85 lb.	90 lb.	112 lb.	130–140 lb.	Entries.
Narrandera	...	7	7	3	5	2	2	1	27
Berrigan	1	1	7	7	5	2	...	...	23
Oaklands	...	2	9	4	3	1	1	...	20
Culcairn	...	2	4	1	2	...	2	...	11
Henty	...	...	3	7	5	7	...	...	22
Total ...	1	12	30	22	20	12	5	1	103

It will be seen that sixty farmers applied 70 lb. per acre and upwards, while one crop, which was placed third in its district, received as much as 135-140 lb. per acre; only thirteen received applications of 56 lb. or less per acre. There is no doubt that the benefits obtained from heavier applications of superphosphate, in some districts, and on soils which warrant it, are becoming more widely recognised each year, and this, with the larger amount of seed being used on well-fallowed land, has brought about a marked difference in yields wherever such methods have been adopted.

Crop Diseases.

Several of the crops inspected were infected with take-all; flag smut and loose smut were very much in evidence, as the season lent itself to the attack of such fungous diseases, many of the fallows having to be worked in a dry condition. Only one crop was seen in which slight traces of bunt was found; take-all and flag smut also affected this particular crop (Federation). The seed used had been untreated owing to circumstances which were unavoidable, but the crop was otherwise excellent, and was estimated to yield 36 bushels per acre. Foot-rot was seen in several crops, but not to any great extent.

Cleanliness.

The presence of wild oats in large quantities on many of the old cultivation paddocks marred what were otherwise good crops. Very few crops seen were affected by variegated and saffron thistles to any extent, but wild mustard had gained a firm hold on several properties. In every case where large numbers of sheep had been grazed on the fallows, the weed growth had been reduced to a marked extent, and owing to the manner in which the sheep had compacted the sub-surface soil, heavier crops of wheat resulted.

Farmers who intended feeding sheep on stubble affected to a great extent by fungous pests, were advised not to place their flocks on fallowed land immediately after coming off affected stubble, but to give them a short period on pasture so that there would be less risk of land ready for wheat being infected by that means.

All the crops throughout the competitions were sown on fallowed land, and so complied with the conditions governing the championship competition. The time of ploughing ranged from the middle of May to the end of September, and sowing took place from 16th April to 12th June. A noticeable feature is the fact that, almost without exception, farmers are now sowing the late-maturing varieties early in the season, following with mid-season, and then early-maturing varieties in their correct order, as advocated by departmental officers. Most of the sowings are completed by the end of May, very few being left till after the first week in June during the past season.

The outstanding features noted during this season's competitions were the results obtained from the heavier applications of seed and manure, and the wonderful recovery made by wheat crops in the drought-stricken parts after the 3 inches of rain which fell late in September and early in October. A number of the crops seen were in such a bad state at this particular time that farmers contemplated feeding them off with sheep, and so obtaining what benefit they could from crops which did not appear to be a payable proposition for grain.

TO CLEAN TOMATO SEED.

THE best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

A few points in the selection of the fruit are worth noting. Select only from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit. Cut several fruit open to be sure of the quality. Choose a plant that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Be sure the plant is free from disease as several tomato diseases are transmitted by the seeds. As a further precaution, the seeds, before planting, should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water. The seed should then be rinsed in clean water and dried.—R. THOMPSON, Experimentalist, Bathurst Experiment Farm.

Farmers' Experiment Plots.

Wheat and Oat Variety and Manurial Trials, 1927.

WESTERN DISTRICT (PARKES CENTRE).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

Experimental and demonstrational areas under the control of experiment committees of the various branches of the Agricultural Bureau were again established during 1927, and fourteen branches co-operated with the Department of Agriculture in the work. In addition, four other areas were established with farmers who are distant from Bureau branches. Many field days and afternoons were held during the spring, when inspections of experimental plots and field crops were made, the total attendances at such inspections being 825.

The Season.

The rainfall at the various centres was as follows :—

Rainfall.

	Ootha.	Murrumbogie.	Bogan Gate.	Wongalea.	Peak Hill.	Alectown.	Tichborne.	Daroobalgie.	Forbes.
					Fallowing Period.				
1926.	points.	points.	points.	points.	points.	points.	points.	points.	points.
June ...	106	116	126	162	119	113	163	147	185
July ...	109	80	130	113	104	67	142	81	80
August ...	121	72	77	115	120	108	104	64	40
September ...	105	127	127	82	140	137	93	106	190
October ...	25	26	29	23	46	34	55	48	70
November ...	nil.	24	nil.	nil.	4	14	nil.	nil.	nil.
December ...	235	152	324	285	236	435	366	222	200
1927.									
January ...	282	170	252	290	369	311	341	434	250
February ...	39	147	nil.	25	23	74	90	nil.	40
March ...	149	118	150	240	195	90	114	216	14
Total. ...	1,171	1,032	1,215	1,335	1,356	1,383	1,468	1,318	1,069
					Growing Period.				
1927.									
April ...	108	145	119	114	150	140	93	55	26
May ...	18	33	54	40	70	51	60	66	38
June ...	52	25	75	78	140	137	104	95	nil.
July ...	59	33	44	35	52	59	76	19	10
August ...	24	69	20	70	72	91	61	72	14
September ...	159	212	127	170	304	208	225	122	260
October ...	74	75	231	110	82	139	107	262	160
Total ...	494	592	670	617	870	825	726	691	508

Excessive rains in the autumn of 1926 and the subsequent frequent light falls of June and July, kept many soils in a condition too wet for ploughing, which was generally late. Scanty rains until late December precluded efficient spring workings of the fallows, but good falls in December and January, 1927, enabled fallows to be placed in nice order. From February until the end of September all centres registered considerably below the average rainfall, the most acute period being from April onwards. At sowing time fallows varied from fair to good in condition, only those which had received special attention having a uniform moisture content. The moisture was generally too far below the mulch, and in very many instances faulty germination occurred.

Faulty germinations, followed by adverse growing conditions—heavy frosts, and an exceptionally dry winter—seriously affected prospective yields, so much so that, in many centres, the plots failed completely. In the more easterly centres, where crops are later in reaching maturity, the good rains of late September were in time to save languishing growths, and from medium to excellent returns were harvested. The rains of October continued to improve matters, and November and December—the months of harvest, being reasonably free from storms—enabled a generally satisfactory sample to be harvested. Second growth was troublesome in the crops that had been most severely hit by the dry conditions, and in some cases it caused a delay of one to two weeks in the harvesting of well-grown crops.

The Pure Seed Wheat Areas.

The farmers co-operating in conducting the pure seed wheat areas were as follows:—

A. Pearce, "Sunrise," Reedy Creek.
T. R. Jones, "Birdwood," Forbes.
D. L. N. Miller, "Glenlossie," Daroobalgie.
B. C. Adams, "Sunnyside," Cookamidgera.
R. Job, "St. Elmo," Parkes.
G. J. Woods, "Homeleigh," Alectown.
W. H. Swain, "Riverview," Peak Hill.
A. Millgate, "Rock Vale," Parkes.
E. J. Johnson, "Iona," Wongalea.
V. Coombs, "Poxthorpe," Bogan Gate.
Mailer Bros., "Trundle Park," Trundle.
R. G. Horsburgh, "Avilon," Tullamore.
L. J. Mathews, "Voorla," Murrumbogie.
C. J. Schlunki, "Line View," Derriwong.
J. M. Connor, "Kokum," Ootha.
W. W. Watson, "Woodbine," Tichborne.
V. Hughes, "Greenacres," Pullabooka.
E. J. Allen, "Gregra." Manildra.

Reedy Creek (A. Pearce).—Soil, chocolate loam, undulating; last crop, wheat, 1920; mouldboard ploughed, 4 inches deep, January, 1927; twice harrowed in January, disc cultivated March, springtoothed May; sown 2nd May, combine; seed 60 lb.; superphosphate, 66 lb.; germination good, but growth suffered from dry conditions.

Forbes (T. R. Jones).—Soil, light brown loam; wheat, 1925; disc ploughed August, 1926, 4 inches deep; harrowed August and December; spring-toothed early January and March; combine sown 23rd May and harrowed; seed, 60 lb.; superphosphate, 60 lb.; germination patchy owing to partly moist seed-bed. The plots were badly wilted when September rains came.

Daroobalgie (D. L. N. Miller).—Soil, chocolate clay loam; slightly undulating; mouldboard ploughed 4 inches deep, August, 1926; disc cultivated in October, harrowed December, springtooth cultivated January, 1927;

disc cultivated February, springtooth cultivated and harrowed March, springtoothed mid-May; combine sown 3rd June; seed, 65 lb.; superphosphate, 70 lb. Canberra very bad with flag smut.

Cookamidgera (B. C. Adams).—Soil, light brown loam, undulating; previous crop, wheat 1925; mouldboard ploughed, 4 inches, late September, 1926; springtoothed January, 1927, harrowed March and May; combine sown 14th May; seed, 60 lb.; superphosphate, 56 lb.

Parkes (R. Job).—Soil, light brown loam; mouldboard ploughed 4 inches deep, August, 1926; harrowed October and December, springtoothed end January and early February, and again end April; combine sown, 30th April; seed, 65 lb.; superphosphate, 55 lb.

Alectown (G. J. Woods).—Soil, chocolate loam; mouldboard ploughed 4 inches deep, June, 1926; harrowed August, scarified September, springtoothed January, 1927, and February, harrowed March, springtoothed in April in front of disc drill; sown 28th April; seed, 60 lb.; superphosphate, 60 lb.

Peak Hill (W. H. Swain).—Soil, light brown clayey loam; disc cultivated, February, 1926; mouldboard ploughed, 4 inches, August, 1926; harrowed November, springtoothed January and May; combine sown, 10th May; seed, 60 lb.; superphosphate, 48 lb.

Parkes (A. Millgate).—Soil, chocolate loam, level; wheat 1924; mouldboard ploughed, 4 inches deep, August, 1926; scarified October and again February, springtoothed March, scarified April; combine sown, 29th April; seed, 60 lb.; superphosphate, 60 lb.

Wongalea (E. J. Johnson).- Soil, chocolate to black clayey loam; wheat 1924; disc ploughed August, 1926; harrowed September, springtoothed October, scarified December and January, harrowed twice in February, springtoothed March and April; combine sown and harrowed, 12th May; seed, 70 lb.; superphosphate, 80 lb.

Bogan Gate (V. Coombs).—Soil, light red loam; mouldboard ploughed, 4 inches, August, 1926; springtoothed October, January, and twice in February, harrowed April; combine sown, 7th May; seed, 55 lb.; superphosphate, 65 lb.; germination of Federation patchy, Canberra and Bena fair, Waratah good; growth uneven.

Trundle (Mailer Bros.).—Soil, chocolate loam; springtoothed February, 1926; disc cultivated June and again September, springtoothed January, and in front of combine drill on 2nd May; seed, 50 lb.; superphosphate, 60 lb. Gluyas lodged badly. Plots did not yield as well as anticipated as the growth appeared to be equal to nine bags; late frosts probably affected the yields.

Tullamore (R. J. Horsburgh).—Soil, brown loam; moulboard ploughed, 4 inches, August, 1926; disc cultivated October, scarified January, February, and March; combine sown, 12th May; seed, 60 lb.; superphosphate, 60 lb.

Yields of Pure Seed Wheat Areas.

Variety.	Reedy Creek.	Forbes.	Daroobalgie.	Cookamidgera.	Parkes.	Alectown.	Peak Hill.	Parkes.	Wongalea.	Bogan Gate.	Trundle.	Tullamore.	Murrumbogie.	Tichborne.	Pullabooka.	Gregro.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	23 47	19 18	11 31	15 00	9 34	12 15	13 00	27 3	27 6	6 32	15 00	8 46	8 4	6 00	1 30	16 18
Waratah	25 13	16 42	15 22	19 00	12 46	18 52	19 00	31 45	34 29	8 20	17 15	11 30	11 40	10 10	4 30	24 4
Bena	25 12	18 26	18 27	20 00	11 34	18 50	20 00	22 35	36 52	8 00	17 00	9 30	...	9 30	5 42	22 35
Yandilla King ...	33 32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Roseworthy	21 15	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Gresley	...	20 17	...	...	12 18	...	...	...	...	...	...	10 42	8 29	7 50	...	20 48
Federation	...	19 49	16 4	13 19	12 52	19 36	16 00	28 55	34 40	8 31	17 15	...	...	10 40	4 16	...
Nabawa	...	...	20 12	...	...	...	...	...	...	...	...	16 30	...	...	...	...
Turvey	...	...	18 27	...	...	26 8	...	...	...	...	...	...	...	12 44	...	...
Gluyas Early ...	...	...	...	...	...	...	...	...	...	...	17 30	...	...	...	...	...
Clarendon	...	...	...	...	...	...	...	...	...	...	...	...	9 58	...	...	...
Caliph	...	...	...	...	...	...	...	...	...	...	...	...	11 40	...	...	...

Murrumbogie (L. J. Mathews).—Soil, red loam; disc ploughed, 4 inches, July, 1926; springtoothed October, January, February, and March; combine sown, 18th to 20th April; seed, 60 lb.; superphosphate, 60 lb.

Derriwong (C. J. Schlunki).—Soil, red loam; stubble burnt end of November, 1926, by bush fires; disc cultivated December, 1926; springtoothed January; combine sown, 23rd April; seed, 56 lb.; superphosphate, 56 lb. Owing to poor germination and dry weather, the plots failed completely and no results were obtained.

Ootha (J. M. Connor).—Soil, red loam, undulating; mouldboard ploughed, 4 inches, August, 1926; springtoothed January and March; combine sown, 3rd May; seed, 60 lb.; superphosphate, 47 lb.; wheat sown in dry seed-bed. The rain was insufficient throughout the winter to germinate the seed and the plots failed completely.

Tichborne (W. W. Watson).—Soil, light loam; mouldboard ploughed, 4 inches, August, 1926; springtoothed September, November, and February; harrowed February; combine sown, 4th May and harrowed; seed, 60 lb.; superphosphate, 60 lb. Germination was irregular and patchy and plots suffered severely during the dry period.

Pullabooka (V. Hughes).—Soil, red loam; mouldboard ploughed, 4 inches, September, 1926; springtoothed January, harrowed April, springtoothed April, disc cultivated May; combine sown, 17th May; seed, 58 lb.; superphosphate, 60 lb.; germination patchy; growth poor and heads failed to fill satisfactorily.

Gregra (E. J. Allen).—Soil, chocolate loam, mouldboard ploughed, 4 inches, July, 1926; disc cultivated September, springtoothed October, disc cultivated February, springtoothed April and again in May; combine sown, 10th May; seed, 66 lb.; superphosphate, 66 lb.

Wheat Variety Trials.

The following farmers co-operated in conducting wheat variety trials:—

J. Townsend, "Willow Vale," Parkes.
G. Mill, "Hazlemere," Gunningbland.
S. J. Plowman, Emu Vale, Parkes.
J. Jelbart, Penryn, Trewilga.
I. Tanswell, Clevonden, Parkes.
W. R. Thomas, "Ardmona," Forbes.
S. Tomkins, "Westnook," Tichborne.
W. H. Allen, Mayura, Forbes.
K. Gault, "Lynwood," Trundle.
W. Hall, Glenowra, Trundle (Murrumbogie).
G. A. Heinrich, Mayfield, Ootha.
P. F. Darcy, Innesvale, Bogan Gate.
D. R. Gray, Glenora, Albert.
J. Nelson, Rockdale, Derriwong.
R. G. Horsburgh, Avlon, Tullamore.

Parkes (J. Townsend).—Soil, greyish to black silty loam; deep alluvial formation; mouldboard ploughed, 4 inches, August, 1926; harrowed September, springtoothed October, January, and February; lightly disc cultivated in May; combine sown, 4th May; seed, 60 lb.; superphosphate, 60 lb.; the plots were not affected by the dry conditions and exceptionally high yields were secured.

Gunningbland (G. Mill).—Soil, chocolate to black clay loam of self-mulching type; wheat 1923; disc cultivated October, 1925, and again January, 1926; disc ploughed 4 inches, June, 1926; disc cultivated July and September; springtoothed November, twice in January, and in April and May; the two years fallow and frequent workings were given to destroy black oats which had been troublesome in this land; combine sown 16th May; seed, 70 lb.; superphosphate, 103 lb. The rainfall on the plots was approximately the same as that registered at Wongalea.

Parkes (S. J. Plowman).—Soil, chocolate to black clay loam, self-mulching type; mouldboard ploughed, 4 inches, August, 1926; springtoothed December, January, and March, harrowed March; sown with combine, 10th to 17th May; seed, 58 lb.; superphosphate, 60 lb. Bogan (4G), Ajax (64), and the unnamed wheats were produced by Mr. Plowman and his sons, being selections from crosses made several years back.

Trewilga (J. Jelbart).—Soil, chocolate loam; wheat 1924; mouldboard ploughed, 4 inches, August, 1925; harrowed November, scarified January; mouldboard ploughed, 4 inches, August, 1926; harrowed October; springtoothed January, harrowed January and March; combine sown, 8th May; seed, 50 lb.; superphosphate, 45 lb. Clarendon and Bogan tipped considerably.

Parkes (I. Tanswell).—Soil, chocolate loam, slightly undulating; wheat 1924; disc ploughed May, 1925; disc cultivated August, springtoothed October and February, disc cultivated April, harrowed July, springtoothed February; disc cultivated March; combine sown, 30th April; seed, 60 lb.; superphosphate, 60 lb.

Forbes (W. R. Thomas).—Soil, red and grey clay loam; disc ploughed, 4 inches, July, 1925; springtoothed September, disc cultivated January; mouldboard ploughed, 4 inches, May, 1926; disc cultivated, 3 inches, October; springtoothed January, 1927; combine sown, 3rd May; seed, 60 lb.; superphosphate, 50 lb.

Tichborne (S. Tomkins).—Soil, chocolate to black clay loam, self-mulching type; mouldboard ploughed, 4 inches, September, 1926; disc cultivated January, harrowed March; combine sown, 10th May; seed, 60 lb.; superphosphate, 50 lb.; seed-bed was loose and deep and germination very poor; growth poor.

Forbes (W. H. Allen).—Soil, red loam, undulating; mouldboard ploughed, 4 inches, July, 1926; harrowed October, springtoothed twice in January, twice in February, once in March; combine sown 6th May; seed, 58 lb.; superphosphate, 56 lb.

Trundle (K. Gault).—Soil, brown loam to clay loam; disc ploughed, 4 inches, July, 1926; springtoothed September and February, harrowed March; combine sown 1st May; seed, 50 lb.; superphosphate, 50 lb. Flag smut rather noticeable throughout, even Gresley having a slight infection.

Trundle (W. Hall).—Soil, red loam, undulating; new ground; disc ploughed, 4 inches, July, 1926; springtoothed September and April; combine sown 28th April; seed, 72 lb.; superphosphate, 38 lb.

Ootha (G. A. Heinrich).—Soil, red loam; disc cultivated, 3 inches, August, 1926; disc cultivated October, springtoothed February; combine sown 26th April; seed, 50 lb.; superphosphate, 50 lb.

Plots also sown at Bogan Gate, Albert, and Derriwong, but owing to the very dry conditions from sowing until September, they failed to germinate satisfactorily.

YIELDS of Wheat Variety Trials.

Variety.	Parkes. (J. Townsend)	Gunningbland.	Parkes (S J. Plowman).	Trewilga.	Parkes (I Tanswell).	Forbes (W. R. Thomas).	Tichborne.	Forbes (W H Allen).	Trundle.	Murrumbogie	Ootha.	Tullamore.
	bus lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	46 35	23 07	23 15	12 48	18 29	...	4 00	13 21	5 42	8 00	3 35	8 30
Waratah	55 05	...	26 50	16 36	23 26	19 11	7 00	15 59	7 31	7 24	4 27	...
Bena	44 26	41 18	20 40	14 50	19 29	15 15	10 00	13 44	17 08	5 08	2 45	...
Bogan (4 G)	54 47	38 09	32 54	16 00	28 25	18 53	6 00	12 24	...	...	...	...
Sultan	...	34 23	...	...	...	...	...	...	...	...	...	...
Gresley	...	32 19	...	...	...	...	...	...	8 09	8 17	5 02	...
Binya	...	31 56	...	...	...		...	...	...			9 31
Turvey		...	...	25 05	...	...	9 00	14 45	...	...	...	...
Yandilla King	...	...	...	21 36	...	...	...	...	...	...	...	...
Federation	...	...	28 50	20 34		...		...	10 32	...	...	...
Clarendon	...	...	...	9 32	...			...	...	...	...	...
Baroota Wonder	...	...	...	...	18 04			...	...		...	...
Quality	...	...				12 15		...		...	...	...
Nabawa	...	...	...	...	...	23 49	6 00	...	...	...	...	16 30
Wandilla	...		...	...	...	...	9 00	...	...	...	...	...
Florence	...		...	...	...	...	6 00	...	...	...	...	...
Gluyas	...		...	...		...	...	...	...	...	6 00	12 28
Rajah	...	...	...	...	...	...			...	...	5 30	...
Onas	...	...	...	...	...	...	...	...	...	...	3 43	...
Ford	...	...	31 12				...	...	...	...	...	...
Cookapoi (4 U)	...	...	26 17			19 53	...	...	8 48	...	...	...
137	...	...	21 18	...	...	...	...	10 27	...	...	...	...
206	...	...	25 17	...	20 22	...	9 00	...	...	...	...	...
4 P.	...	...	23 51	...	...	17 39	...	...	...	...	...	...

In the trial conducted by Mr. Plowman, the following wheats were included:—212C 26 bus. 1 lb.; 212G, 26 bus 13 lb; 212F, 22 bus. 21 lb.; No 214, 23 bus. 9 lb; No. 67, 30 bus. 26 lb.; Ajax (No. 64), 28 bus. 12 lb The varieties Bogan, Ajax, Cookapoi, and the unnamed wheats were produced by Mr. Plowman and his sons.

The yields secured from some of the areas were exceptionally good, mainly owing to most efficient working of the fallows. The rainfall from the date of sowing until the end of October, when the crops were ripening, did not exceed 5 inches in some localities, yet Messrs. Johnson and Mill secured yields of between 30 and 40 bushels per acre.

Waratah gave the highest yields throughout both series of trials, followed by Bena. The latter variety generally turns out better than the prospective yield. Bogan did surprisingly well in the eight plots in which it was tried. Nabawa proved resistant to flag smut, and its yield promises to be

satisfactory. Turvey behaved well under the dry conditions. Canberra was disappointing throughout the district, both in the plots and in field crops. There is little doubt that most of the Canberra wheat was frosted.

Wheat Manurial Trials.

The following farmers co-operated in conducting wheat manurial trials:—

G. Mill, "Hazlemere," Gunningbland.
Davies Bros., "Colwyn," Brolgan.
J. G. McH. Grant, "Greenwich," Trundle.
G. G. Tanswell, "Glenora," Parkes.
W. Tyrrell, "Oakleigh," Tichborne.
J. Pearce, "Willow Farm," Reedy Creek.
W. Scot, "Deloraine," Bogan Gate.
A. Fraser, "Kaludah," Albert.
R. H. Doberer, "Good Hope," Derriwong.
W. J. Sanderson, Avilla, Condobolin.

Gunningbland (G. Mill).—The cultural details were the same as for the wheat variety trial; disc cultivated October, 1925, and January, 1926; disc ploughed, 4 inches, June; disc cultivated July and September, springtoothed November, twice in January and again in April and May; combine sown 16th May and harrowed; seed, 58 lb.; variety, Canberra. Prospective yields corresponded with the increase of superphosphate, but the plots were affected by frost, the denser plots apparently being most affected. Included in the wheat variety trial and alongside the manurial trial were two plots of Sultan wheat, sown with different quantities of superphosphate. The plot to which was applied 100 lb. superphosphate gave a yield of 34 bushels 23 lb., and the 200 lb. plot yielded 42 bushels 10 lb.

Brolgan (Davies Bros.)—Soil, chocolate to black clay loam; self-mulching type; mouldboard ploughed, 4 inches, July, 1926; disc cultivated October, springtoothed January, February, and March; combine sown 2nd June; seed, 45 lb.; Canberra. The seed-bed was too loose and deep, and germination was patchy and slow.

Trundle (J. G. Grant).—Soil, red loam; mouldboard ploughed, 3 inches, February, 1927; sown combine 10th May and harrowed; seed-bed lumpy and uneven; seed, 50 lb. Federation. Germination patchy and slow.

Parkes (G. G. Tanswell).—Soil, brown loam; mouldboard ploughed, 3½ inches, August, 1926; springtoothed January, disc cultivated May; combine sown 24th May; seed, 62 lb. Canberra.

Tichborne (W. Tyrrell).—Soil, brown light loam; mouldboard ploughed, 4 inches, May, 1926; harrowed May; mouldboard ploughed, 3 inches, July; harrowed October, springtoothed January, February, March, and May; combine sown 27th May; seed, 60 lb.; Canberra.

Reedy Creek (J. Pearce).—Soil, red loam, mouldboard ploughed, 3 inches, January, 1927; springtoothed February, harrowed March, springtoothed May; combine sown 18th May; seed, 60 lb.; Waratah.

Plots were also sown at Bogan Gate, Albert, Derriwong, and Condobolin, but owing to the dry conditions they failed to germinate.

YIELDS of Wheat Manurial Trial.

Fertiliser per acre.	Gunningbland.	Brolgan.	Trundle.	Parkes.	Tichborne.	Reedy Creek.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure	...	...	10 40	7 25	...	...
Superphosphate, 40 lb....	...	13 13	12 50	9 55	...	22 19
" 50 lb....	28 15	...	...	...	...	...
" 60 lb....	...	17 29	13 20	12 08	10 40	22 38
" 70 lb....	27 54	...	...	...	8 40	...
" 80 lb....	...	16 08	14 40	10 45	7 28	23 56
" 100 lb....	31 13	23 27	...	...	...	...
" 140 lb....	30 51	...	...	...	...	...

Rate of Seeding Trials.

The undermentioned farmers co-operated in conducting rate of seeding trials:—

Mailer Bros., "Claris Park," Trundle.
W. Tyrrell, "Oakleigh," Tichborne.
J. Pearce, Willow Farm, Reedy Creek.
Davies Bros., "Colwyn," Brolgan.
V. Coombs, "Poxthorpe," Bogan Gate.
W. Scott, "Deloraine," Bogan Gate.
J. Martin, Kerriwah, Albert.

Trundle (Mailer Bros.).—Soil, chocolate loam, mouldboard ploughed, 4 inches, August, 1926; sprintoothed January, 1927; disc cultivated March; springtoothed early May; combine sown 10th May; superphosphate, 65 lb.; variety, Canberra.

Yields.—40 lb. seed	10 bushels.	
56 lb. "	11 "	40 lb.
70 lb. "	11 "	

Tichborne (W. Tyrrell).—Soil, light loam, mouldboard ploughed, 4 inches, May, 1926; harrowed May; mouldboard ploughed July; harrowed October, springtoothed January, February, March, May; combine sown 23rd May; superphosphate, 56 lb.; variety, Canberra.

Yields.—55 lb. seed	8 bushels.	
65 lb. "	7 "	52 lb.
75 lb. "	8 "	24 "

Reedy Creek (J. Pearce).—Soil, red loam; mouldboard ploughed January, 1927; springtoothed February; harrowed March, springtoothed May; combine sown 17th May; superphosphate, 56 lb.; variety, Waratah.

Yields.—50 lb. seed	26 bushels	15 lb.
60 lb. "	25 "	16 "
70 lb. "	25 "	16 "

Brolgan (Davies Bros.).—Two of the three plots were considerably affected by white grubs, and as the results are not comparable, it is inadvisable to record them.

The plots sown at Bogan Gate and Albert failed to germinate owing to the dry conditions.

Pure Seed and Variety Trials with Oats.

The main purposeof these areas is to produce supplies of pure clean seed The grain yield is not the all important factor, the oat crop being regarded as for farm consumption—as green grazing areas until August, and then as the basis for fodder reserves in the form of silage, hay, or grain. A quick growing oat, which gives the greatest bulk of early grazing, and which comes away well after the stock have been removed, is therefore the one desired.

The following farmers co-operated in conducting pure seed and oat variety trials :—

J. Pearce, "Willow Farm," Reedy Creek.
H. Green, "Kia-Ora," Forbes.
W. R. Gunning, "Clothilde," Daroobalgie.
A. P. Unger, "Stony Hill," Alectown.
J. Clatworthy, "Beechmore," Parkes.
W. H. Swain. "Riverview," Peak Hill.
A. Scrivener, "Hildavale," Gunningbland.
W. J. Dwyer, "Daisy Park," Bogan Gate.
J. G. Grant, "Greenwich," Trundle.
Curr Bros., "Murrumbogie," Trundle.
C. W. Buckland, "Kangetong," Ootha.
R. H. Doberer, "Good Hope," Derriwong.

Reedy Creek J. Pearce).—Soil, loam; mouldboard ploughed, 4 inches, October, 1926; harrowed October and November, springtoothed December and February, harrowed March, springtoothed May; combine sown 17th May; seed 50 lb.; superphosphate 56 lb.; germination very good; Mulga did not benefit from the September rains to the same extent as the other varieties and some grain was lost by shelling owing to delayed harvesting, the result of second growth.

Forbes (H. Green).—Soil, loam; oats 1925; disc ploughed 4 inches, August, 1926; harrowed August, springtoothed September, disc cultivated October, springtoothed December, disc cultivated May; combine sown 7th May; seed 60 lb.; superphosphate 60 lb.; germination thin, growth poor; plots did not benefit from September rains.

Daroobalgie (W. R. Gunning).—Soil, chocolate loam; grass land; mouldboard ploughed August, 1926; springtoothed September, twice in January and again in March; combine sown 18th April; seed 48 lb.; superphosphate 57 lb.; germination good, growth medium; Buddah and Mulga did not benefit from September rains and failed owing to what growth there was lodging and the grain shelling before the crop could be harvested.

Alectown (A. P. Unger).—Soil, chocolate loam, mouldboard ploughed, 4 inches, July, 1926; harrowed August, springtoothed September, scarified December and January, harrowed January, scarified February, springtoothed March, harrowed March; combine sown 16th May; seed 40 lb.; superphosphate 50 lb.; germination medium, growth medium; loose smut was noticeable in Sunrise and Lachlan.

Peak Hill (W. H. Swain).—Soil, clay loam; disc-cultivated February, 1926; mouldboard ploughed, 3½ inches, August; harrowed November, springtoothed January and May; combine sown 10th May; seed 40 lb.; superphosphate 48 lb.; germination and growth both medium.

Gunningbland (A. Scrivener).—Soil, chocolate loam; wheat 1924; disc-cultivated April, 1926; scarified July, scarified October, springtoothed January 1927, scarified April, springtoothed May, combine sown 27th May; seed 40 lb.; superphosphate 48 lb.; germination good, growth fair. Lachlan benefited most from September rains.

Bogan Gate (W. J. Dwyer).—Soil, loam; mouldboard ploughed, 4 inches, August, 1926; springtoothed January and March, harrowed April; combine sown 26th April; seed 40 lb., superphosphate 56 lb; germination very poor, growth poor; the earlier varieties failed, the September rains saving the later varieties.

Trundle (J. G. Grant).—Mouldboard ploughed 3 inches, February, 1927; combine sown 9th May; seed 40 lb.; superphosphate 45 lb.; germination was very poor and growth poor.

Ootha (C. W. Buckland).—New ground; mouldboard ploughed, 3 inches, September, 1926; harrowed November, springtoothed January, 1927, harrowed April, springtoothed April; drill sown 24th April and harrowed, seed 40 lb.; superphosphate 45 lb.; germination patchy, growth poor.

Derriwong (R. H. Doberer).—Soil, red loam; stubble burnt by November bush fires; springtoothed January, 1927, disc cultivated March; combine sown 29th April; seed 40 lb.; superphosphate 40 lb.; no germination, owing to dry conditions.

Trundle (Curr Bros.).—Soil, red loam; new ground; disc ploughed July, 1926; springtoothed September; harrowed January, 1927; combine sown 14th April; seed 40 lb.; superphosphate 60 lb.; germination good, but growth very poor; plots fed off September as they had wilted past recovery.

YIELDS of Pure Seed and Variety Trials.

	Reedy Creek.	Forbes.	Daroobalgie.	Alectown	Peak Hill.	Gunningblan	Bogan Gate.	Trundle.	Ootha.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	47 20	...	...	...	...	...	...	...	...
Belar ...	38 27	...	16 14	...	...	...	10 20	...	...
Mulga ...	33 5	12 00	Failed	28 35	21 00	15 20	Failed	13 3	11 35
Lachlan ...	...	12 20	16 00	27 18	19 00	17 00	9 00	17 16	11 21
Buddah ...	...	10 00	Failed	29 28	21 00	14 00	Failed	13 13	10 00
Sunrise ...	...	...	...	39 21	...	...	...	...	...

The plots sown at Derriwong (R. H. Doberer), Trundle (Curr Bros.), and Parkes (J. Clatworthy), failed completely owing to the dry conditions.

Oats Manurial Trial.

To determine if nitrogen will influence the yield of oats, two manurial trials were conducted. The experiment consisted of three plots, viz., (1) No manure, (2) M5 mixture (consisting of 56 lb. superphosphate and 34 lb. sulphate of ammonia), and (3) 56 lb. superphosphate.

Reedy Creek (J. Pearce).—Soil, loam; mouldboard ploughed, 4 inches, October, 1926; harrowed October and November, springtoothed December and February, 1927, harrowed March, springtoothed May; combine sown 18th May; seed 50 lb., variety Mulga; germination good, growth medium.

	bus.	lb.
Yields—No manure	29	30
102 lb. M5 mixture	30	39
56 lb. Superphosphate	33	5

Bogan Gate (W. J. Dwyer).—Soil, loam; mouldboard ploughed August, 1926; springtoothed January and March, harrowed April; combine sown 26th April; seed 40 lb., variety Mulga. Owing to dry conditions plots failed completely.

WESTERN DISTRICT (DUBBO CENTRE).

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor

During 1927, the following farmers co-operated with the Department of Agriculture in conducting cereal experiments in this district:—

S. Reilly, junior, Eurimbla, *via* Cumnock.
Quirte and Everett, "Narrawa," Wellington.
A. D. Dunkley, "Allowah," Terra Bella, *via* Geurie.
H. J. Harvey, "Kindalin," Dubbo.
James Bell, "Glenara," Wollumbi Soldiers Settlement, Geurie.
Barry O'Neill, "Baringa," Narromine.
J. Parslow, "Cooya," Balladoran
W. G. Law, "Wattle Park," Armatree.
R. Johns, "Ule Wallen," Baradine.
E Furguson, "Yahringhirie," Bugaldi, *via* Coonabarabran.
A. D. Burness, "Yandilla," Purlewaugh, *via* Coonabarabran.
W. G. R. Uphill, "Keadool," Purlewaugh.
T. R. Sanson, "Lockwood," Purlewaugh.
L. C. J. Broughton, "Berrima," Mendooran.
Lindsay Green, "Denison Farm," Leadville.
Andrew Harper, "Cockle Shell Corner," Toongi.
S. J Taylor, "Happy Valley," Tomingley.
R W. Reeves, Hamilton Falls, Dubbo.
H. Riach, "Werona," Dubbo.
Tink and Roberts, "Roslyn," Coboco.
J. Vearing, "Glenloth," Eumungerie.
A. Leach, "Sedgemoor," Eumungerie.
E. Dohnt, "Bonnie Doon," Eumungerie.
H. C. Lowe, "Claydon," Coboco.

Owing to excessively dry conditions during the germination and growing period the plots were failures at the farms of H. Riach, A. Leach, C. Lowe, E. Ferguson, and L. C. J. Broughton. Patchy germination was the main trouble.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The Season.

This portion of the western district experienced a bad season for 1927, and it was only those crops sown early on well prepared land which finally returned anything like payable yields. Owing to the heavy rains in the autumn of 1926 delaying sowing operations in many centres well into June and July, the majority of fallows were not ploughed until August. From mid-September to late December dry conditions prevailed, and this was not conducive to giving the fallows an essential deep cultivation and putting them in good order. Heavy rains about Christmas time and early January enabled the fallows to be worked up satisfactorily in many instances, but others were set hard by these falls and had to be reploughed.

RAINFALL Records.

Locality.	Eurimbla.	Wellington	Dubbo.	Narromine.	Balladoran.	Armatree.	Purlewaugh.	Leadville.	Wollumbi.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
1926—									
July	...	...	75	93	68	...	...	105	...
August	175	100	88	105	69	62	38	83	...
September	184	190	175	160	196	117	152	212	...
October	33	44	30	28	81	61	36	38	...
November	34	29	7	...	9	27	...	14	...
December	360	529	520	331	442	205	839	783	...
1927—									
January	287	197	120	198	117	125	238	273	...
February	...	8	...	...	...	24	12	...	...
March	72	23	158	80	90	96	64	30	...
Total on fallow ...	1,145	1,120	1,173	995	1,072	717	1,379	1,538	...
April	303	510	199	260	112	155	388	277	327
May	33	23	15	16	17	29	...	...	32
June	66	63	63	55	96	133	132	35	68
July	23	12	37	3	...	53	51	45	11
August	85	137	58	134	114	25	61	75	102
September	161	112	232	193	70	85	42	95	117
October	100	162	93	177	96	40	196	65	162
November	70	...	...	...	...	...	...	...	...
Total growing period	841	1,019	697	838	505	520	870	592	819
Grand Total ...	1,986	2,139	1,870	1,833	1,577	1,237	2,249	2,130	...

February and March were also dry, accompanied by hot, windy conditions, but good rains in April about Easter time enabled those who were prepared to get busy with cultivating and sowing. From the beginning of May until the last day of September (a period of five months) the aggregate rainfalls at all centres barely exceeded 2 inches, and no one fall of an inch was recorded. Therefore it was only those crops which were sown in the April moisture, and which also had moisture from earlier rains stored in the fallows, which germinated at all satisfactorily and managed to exist without serious damage

during this long dry growing period. Not even in the drought years of 1888, 1902, and 1918 was the aggregate rainfall during the aforementioned winter months so low. Fortunately, good soaking rains were experienced at the end of September and early October, and these saved the position from being a total crop failure, as by that time even well fallowed land had practically given up all its stored reserves of moisture. Many crops which were not too far gone or which had not been fed off beyond recovery, recovered wonderfully, and at least the seed and local milling requirements were assured. Certain centres, particularly the later maturing districts on the western slopes, were more favoured by these late rains, and gave better average yields. Centres on the plain country suffered most on account of the earlier maturity of crops.

Harvesting was largely delayed by the general presence of second growth green ears, which was unfortunate, as during the latter part of November heavy falls of rain spread over nearly a week were experienced at all centres, and these badly bleached the grain, and in certain cases caused it to shoot. Otherwise, the sample would have been plump, of good colour, and of high bushel weight generally.

Cultural Details.

Eurimbla.—Heavy chocolate loam, limestone formation, old land; mouldboard ploughed late August, springtoothed and harrowed October, full depth; springtoothed and harrowed January; harrowed and cross harrowed March; springtoothed 23rd April, disc drilled 25th April at 60 lb. seed and 65 lb. superphosphate on excellent fallow. Harrowed after sowing. Patchy germination in Ford and Federation.

Wellington.—Chocolate gravelly loam, ironstone origin; previous crop, plots in 1925; paddock fifty years old; mouldboard ploughed late August, 4 inches deep; harrowed late September; springtoothed early January; cross springtoothed mid-January; disced late February, harrowed early April, springtooth 26th April; sheeped continuously. Sown disc drill, 27th and 28th April at rate of 60 lb. wheat, 53 lb. oats, 60 lb. basic superphosphate per acre. Harrowed after sowing. Germination rather patchy. Harvested 12th to 22nd November.

Geurie (A. D. Dunkley).—Red to chocolate medium clay loam; old land; disc ploughed early October, 1925; not sown 1926 on account of heavy rain waterlogging soil; re-ploughed September, 1926; springtoothed early November full depth; again mid-January and late April; sheeped during 1927; combine sown 12th–13th May at rate 50 lb. seed and 65 lb. superphosphate.

Dubbo (H. J. Harvey).—Medium red sandy loam, fourth crop; disc cultivated 2½ inches deep July; harrowed and cross harrowed August-September; disced 3½ inches late September; springtoothed late October; springtoothed and crossed late December-January; harrowed early February; harrowed and crossed March; springtoothed 27th April; sheeped frequently; combine

sown 29th–30th April, at rate of 60 lb. wheat, 50 lb. oats, 70 lb. superphosphate per acre. Harrowed after sowing. Excellent fallow, clean and moist. Germination good, but long dry spell made plots spindle and low yields resulted. Canberra and Federation showed flag smut. None seen in Riverina or Wandilla.

Narromine.—Medium red loam, clay subsoil, with good drainage; old land; disc ploughed 4 inches deep July; disced September; harrowed late September; springtoothed January; disced April; springtoothed late April; sheeped frequently; hoe drilled 2nd and 3rd May, using 55 lb. wheat, 50 lb. oats, 70 lb. superphosphate on wheat and 50 lb. on oats per acre. Harrowed after sowing. Germination satisfactory and growth well maintained through long dry spell. Canberra, Waratah, Federation, and Bena yields reduced by flag smut. None seen in Nabawa.

Belar Oats at B. O Neill's, Narromine, 1927.
Yield, 39 bus. 36 lb

Balladoran.—Medium grey sandy loam; new farm for owner and previous details not known except ground very dirty with wild oats. Part mouldboard ploughed, part disc ploughed late July; springtoothed mid-September full depth; again early October, springtoothed mid-December, mid-January, 20th April, and early May. Sheeped continuously. Sown disc drill 4th and 5th May at rate 52 lb. wheat, 50 lb. oats, 50 lb superphosphate on wheat and 40 lb. on oats. Sown shallow to avoid patchy germination in soil moisture at varying depths. No rain fell during May to connect up with subsoil moisture, so seed did not germinate until late June, when 60 points fell. Soil rather

fine owing to frequent workings. Many oats germinated and seriously affected yields. Nabawa was outstanding in yields. Harvested 17th November.

Armatree.—Medium red clay loam; ten previous crops; mouldboard ploughed early August; springtoothed early October full depth; springtoothed late December, early January, early February; harrowed mid-March; scarified early May; sheeped when necessary. Sown disc drill 6th and 7th May in clean, compact moist fallow. Rate of seeding 50 lb., and 56 lb. superphosphate. Good germination throughout, but growth affected at later stages by prolonged dry spell.

Nabawa Wheat at B. O'Neill's, Narromine, 1927.
Yield, 23 bus. 51 lb.

Baradine.—Light grey sandy loam, clay subsoil; mouldboard ploughed late July; disced early January, again late January; springtoothed late April, and harrowed; combine sown 2nd-3rd May at rate of 60 lb. wheat, 50 lb. oats, and 60 lb. superphosphate. Germination good, but parts affected by couch grass and wild oats. Spindly growth. Poor returns, but about the only wheat harvested in the Baradine district this season, which is a recommendation for fallow, fertiliser, and good seed.

Purlewaugh (A. D. Burness).—Red to grey heavy clay loam, stoney; fifth crop; mouldboard ploughed mid-August; springtoothed and harrowed mid-October; skim ploughed November; disced January; scarified late April; sheeped continuously. Combine sown 20th and 21st May at rate 50 lb. seed and 55 lb. superphosphate. Good germination and stooling, with fair average returns for the season.

Purlewaugh (W. R. Uphill).—Sandy loam on apple tree creek flat; land under oats in 1925; mouldboard ploughed and disc ploughed late September; springtoothed late December; disc ploughed shallow late January to kill couch; springtoothed and crossed February; springtoothed and crossed mid-May. Combine sown 23rd May at rate of 50 lb. oats, and 50 lb. superphosphate. Couch grass was very bad, but mostly killed. Very dry on surface from frequent workings. Plots affected by green timber.

Leadville.—Grey gravelly hillside loam, clay subsoil 6 inches; old land; disc ploughed early July 5 inches deep; springtoothed September, late December, late January, and harrowed; skim ploughed 2 inches deep late February; springtoothed early April; springtoothed late April and harrowed; sheeped when necessary. Hoe drill sown 8th and 9th May at rate 58 lb. seed, 70 lb. superphosphate. Patchy germination and spindly growth with parts affected by couch grass.

Wollumbi.—Chocolate medium to sandy loam; sixth crop; disc ploughed late August; springtoothed early November and late January; harrowed February; springtoothed early March; harrowed early April; springtoothed late April; sheeped continuously. Sown disc drill 13th and 14th May at rate of 50 lb. seed, 56 lb. superphosphate. Soil moist but dirty with oats, black thistles, and burrs, which were cut while sowing. Germination good, but large percentage of wild oats.

Dubbo (R. W. Reeves).—Light red sandy loam; old land; mouldboard ploughed early August; harrowed August; disced mid-September; springtoothed mid-October; disced late January; springtoothed early May. Combine sown 16th May at rate of 50 lb. seed, 50 lb. superphosphate.

Tomingley.—Medium red loam; old land; mouldboard ploughed July; springtoothed late August, full depth; springtoothed late September; disced late January; springtoothed early April and early May; combine sown 19th May at rate of 45 lb. seed, 50 lb. superphosphate.

Eumungerie.—Chocolate to black self-mulching heavy loam; mouldboard and disc ploughed August; springtoothed October; disced January; combine sown 27th April at rate of 59 lb. seed. and 55 lb. superphosphate.

Notes on Wheat Varieties.

Of the four standard varieties, the late maturers Yandilla King and Turvey easily outyielded the mid-season Federation, and early maturer Canberra. This was no doubt due to these slow maturers receiving greater benefit from the September and October rains, but they are always consistent yielders on fallowed land.

Canberra was disappointing this season as a yielder, besides being largely affected by flag smut.

Waratah promises to take the place of Canberra as an early maturer giving consistent returns, and not seriously liable to flag smut.

Nàbaua (Bunyip x Gluyas Early) is going to be a very popular wheat, as it is apparently immune to flag smut, which is taking a considerable toll of farmers' crops. It easily topped the yields in the three centres where tested.

Riverina and *Wandilla* maintained a high degree of resistance to flag smut under field conditions, besides giving good crops, and are becoming very popular as seed of these varieties is now obtainable in fair quantities.

Duri (Canberra x Hurst's 14), a brown tip-awned early maturing variety, still maintained the reputation it gained last year as a good doer, and may, together with Waratah, oust Canberra from pride of place.

Duchess.—A mid-season selection by a Uranquinty farmer which looks promising, and was favourably commented on. Has a brown awnless ear.

Nizam.—A Victorian cross-bred from Federation, early maturing, short strawed, with a brown awnless ear. Gave consistent returns where tried.

Gallipoli, another Victorian cross-bred (Clubhead x Yandilla King), has short stiff straw, and a brown awnless clubbed ear, and is mid-season in maturity. Has done well in the Coonabarabran district.

RESULTS of Wheat Variety Trials.

Variety.	Eurimbla.	Wellington.	Geurie (A. D. Dunkley).	Dubbo.	Narromine.	Wollumbi S.S.	Balladoran (J. Parslow)	Armatree.	Baradine.	Purlewaugh	Leadville.	Eumungerie Agricultural Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb
Canberra	12 21	15 49	12 33	8 34	17 2	7 25	2 7	10 5	5 20	15 8	4 37	..
Federation	13 8	24 34	16 47	12 1	18 26	6 58	8 52	10 44	4 46	18 34	6 52	9 18
Yandilla King	...	28 11	23 55	15 58	..	...	3 55	...	.	..	...	.
Turvey	...	..	...	..	20 26	.	.	14 18	5 58	..	10 53	..
Marshall's No. 3	18 57	..	...	...	..	...	.	..	..	18 13	..	.
Waratah	15 25	24 45	...	...	22 17	...	...	...	5 26	...	10 37	7 47
Penny	24 45	..	...	...	...	...	..	...	.	..	..	...
Canimbla	19 56	...	...	...	...	9 14	...	...	..	.	..	...
Ford	11 31	...	...	...	...	...		..	..	17 38	..	.
Cadia	...	25 49	..	...	...	..	...	.	...	...	...	...
Wandilla	..	32 53	..	10 56	.		..	.	...	.	7 30	...
Duri	...	22 8	..	12 15	...	8 24	...	...	...	...	7 6	...
Duchess	...	20 29	.	..	...	8 45	..	.	..	...	.	..
Gresley	...	20 40	13 12	...	...	..	3 2	.	..	..	7 6	..
Bena	..	19 55	..	8 55	18 8	5 28		13 5	...	14 30	.	8 54
Ranee	...	...	14 9	.	18 0	...	..	..	...	...	..	...
Rajah	...	...	19 21	...	...	.	..	.	.	...	...	..
Nizam	...	...	...	11 8	..	7 33	..	..	...	..	...	10 59
Riverina	...	...	...	10 39	...	.	3 20	..	.	.	...	..
Bruce (J. W. Eade)	...	...	...	7 38	...	...	...	..	...	...	...	...
Nabawa	...	...	...	...	23 51	.	6 36	15 11	...		...	..
Baroota Wonder	...	...	...	...	...	...	4 9	...	...	...	...	..
Aussie	...	...	...	...	...	...	4 56	..	...	...	...	8 12
Gallipoli	...	...	...	...	...	...	...	11 15	...	19 59	...	...
Union	...	..	...	...	...	...	..	9 18	...	...	...	...
Currawa	...	...	...	...	...	...	...	...	3 10	...	...	...
Binya	...	...	...	...	...	...	...	...	3 11	...	...	...
Braemar Velvet	...	...	...	...	...	...	...	...	5 3	..	...	...

Fertiliser Trials with Wheat.

A small manurial trial with Canberra wheat was incorporated in all the wheat variety trials In every instance, increased returns from the use of varying amounts of superphosphate resulted, ranging from one-half bushel

to 5¾ bushels. The effect of superphosphate on crops was very noticeable this season. Its chief action was an early stimulation of the root growth, which in turn put the roots in touch with moisture stored in the lower soil stratas, thus enabling these plants to withstand the prolonged dry spell better than those not so assisted which had a shallower root system, and which were forced to maintain a precarious existence on the moisture obtained from the occasional small falls of rain.

Fertiliser trials were also conducted at various centres on comparatively large areas with the object of more forcibly demonstrating the advantages of superphosphate as an aid to increased yields, as some farmers are inclined to disbelieve the results of the smaller trials. Here again in every instance increased returns were obtained on fallowed land. The most outstanding result was at Mr. H. Harvey's, Dubbo, where an increase of 7 bushels per acre was obtained on new land which had been well fallowed.

RESULTS of Fertiliser trials with Canberra Wheat.

Amount of fertiliser per acre.	Eurimbla.	Wellington.	Dubbo.	Geurie (A. D Dunkley).	Narromine.	Balladoran.	Armatree.	Leadville.	Purlewaugh.	Baradine.	Wollumbi S.S.
	bus. lb	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.
Superphosphate (High grade)—											
50 lb.	...	...	...	...	...	2 7	...	...	...	...	...
55 lb.	...	...	...	...	...	...	10 5	...	...	...	7 25
60 lb.	...	*15 49	...	...	...	...	...	...	15 8	5 20	...
65 lb.	12 21	...	...	12 33	...	...	...	...	...	...	...
70 lb.	...	...	8 34	...	17 2	...	...	4 37	...	...	...
Unmanured	7 8	15 23	2 53	9 16	14 5	failed	8 37	3 18	10 30	4 34	5 45
Increase from Superphosphate	5 13	0 26	5 41	3 17	2 57	2 7	1 28	1 19	4 38	0 46	1 40

* Basic superphosphate was used.

Oat Variety Trials.

Oats for grain were tested at nine centres with Algerian as a standard variety for comparison.

The yields were low this season, compared with other years, owing to lack of stooling by the plants.

The outstanding varieties were *Guyra* and *Belar*, two mid-season varieties which do not grow too tall and rank, have strong straw, stand up to rough weather well, produce a good plump, clean sample of grain, and are early enough for grain and hay production purposes under western conditions. If green feed for grazing or silage is required, then Buddah, Mulga, or Sunrise varieties will best suit the purpose.

More oats are being grown each year in the west, as their value on a farm for horse feed, rotation, disease cleaning, fodder conservation, and green feed purposes are becoming recognised.

RESULTS of Oat Variety Trials.

Variety.	Eurimbla.	Wellington.	Dubbo.	Narromine.	Balladoran.	Armatree.	Purlewaugh (W. G. R. Uphill).	Baradine.	Toongi.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	23 12	16 41	12 15	25 0	3 3	20 3	16 30	9 27	11 1
Guyra	36 12	...	16 22	...	..	...	21 6	..	...
Belar	22 6	28 13	...	39 36	4 10	24 32	17 18	6 37	10 30
Buddah	19 30	25 33	14 16	19 34	3 15	16 3	15 31	...	...
Gidgee	...	21 22	10 15	...	...	...	...	...	...
Sunrise	...	20 20	...	...	3 18	14 10	...	5 23	...
Mulga	...	...	16 32	...	...	...	19 36	8 3	...
Myall	...	...	...	36 32	...	...	...	...	10 25

Fertiliser Trials with Oats.

Manurial tests with superphosphate, and fertiliser mixture No. 5, consisting of 68 lb. standard superphosphate and 34 lb. sulphate of ammonia were carried out at four centres, one of which failed. Superphosphate at the rate of 56 lb. per acre easily gave the best results at all centres when cost is also taken into consideration, and also showed large increases over the unmanured areas on fallowed land.

RESULTS of Fertiliser Trials on Large Areas.

	Wellington (Waratah).		Wellington W. T. Everett (Riverina).		Armatree W. G. Law (Wandilla).		Dubbo H. Harvey (Canberra).		Eumungerie Agricultural Bureau J. Vearing on stubble land (Hard Federation).		Eumungerie Agricultural Bureau E. Dohnt (Aussie).	
	bus. lb.	Area acres.	bus. lb.	Area acres.	bus. lb.	Area acres.	bus. lb	Area acres	bus. lb.	Area acres.	bus. lb.	Area acres.
H.G. Superphosphate 50 lb.	...	...	...	...	6 15	20·32	...	..	...	...	6 59	14·37
H.G. Superphosphate 60 lb.	24 45	1·28	18 7	9·92	...	...	..	...	12 1	8·00	...	...
H.G. Superphosphate 70 lb.	...	...	...	...	...	...	17 22	20·5	...	...	...	...
H.G. Superphosphate 75 lb.	...	...	...	...	6 57	23·69	...	...	...	...	...	...
Basic Superphos. 60 lb.	22 1	1·62	11 18	16·01	...	...	...	...	...	...	...	...
Unmanured	20 41	1·61	14 29	17·11	8 37	16 47	10 22	19·5	9 56	8·0	3 15	11·62

RESULTS of Fertiliser Trials with Oats.

	Eurimbla. S. Reilly (Guyra).	Dubbo. H. Harvey (Guyra).	Armatree. W. Law (Belar).
	bus. lb.	bus. lb.	bus. lb.
56 lb. superphosphate	36 12	17 37	24 32
102 lb. No. 5*	23 34	18 7	18 7
Unmanured	22 25	15 23	14 5

* Fertiliser mixture No. 5 consists of 2 parts standard superphosphate and 1 part sulphate of ammonia.

RESULTS of Rate of Seeding Test.

Seed per acre.	E. Dohnt, Eumungerie Agricultural Bureau. Variety—Hard Federation.	
	Area.	Yield.
lb.	acres.	bus. lb.
40	15·73	8 11
55	16·33	7 9
70	15·45	7 12

Three other rate of seeding tests were not completed owing to the crops either failing, being fed off, or not being worth stripping separately.

Pure Seed Wheat Areas.

In conjunction with four branches of the Agricultural Bureau, pure seed plots were established in order to provide good sources of seed supply of the local farmers' own choice. This policy is to be discontinued in the future owing to the great demand for seed for other more useful experimental purposes.

Variety.	Bunninyong Bureau.	Tomingley Bureau.	Coboco Bureau.	Purlewaugh Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	12 26	10 6	......	5 16
Federation	......	9 26	......	......
Bena	......	9 8	......	......
Waratah	15 2	11 29	13 16	......
Marshall's No. 3	......	13 28	......	......
Gresley	......	......	11 56	......
Yandilla King	20 6	......	......	......
Turvey	17 33	......	......	......
Wandilla	......	......	......	7 28
Binya	......	......	......	9 0
Currawa	......	......	......	13 59

Diseases of the Wheat Plant.

Bunt or stinking smut was not present in any of the plots, which is a tribute to the effectiveness of the control of this disease by dusting the seed with dry copper carbonate.

Flag smut is the worst disease that the present day farmer has to contend with, and it is taking a considerable toll of many crops, particularly those of Canberra and Federation origin. Although sound cultivation, rotation, burning of stubbles, and seed treatment will do a great deal towards minimising the severity of the attack, and seasonal conditions also play an important part, it would seem that the hope of the future lies in the breeding and growing of varieties immune or resistant to this disease. Already some success has been achieved in this matter by the production of such varieties as Nabawa, Riverina, and Wandilla, which all show a high degree of resistance.

SOUTH-WESTERN DISTRICT.

G. NICHOLSON, H.D.A., Agricultural Instructor.

In the season 1927, the following farmers conducted wheat and oat experiment plots :—

G. C. Circutt, " Uabba," Lake Cargelligo.
T. W. Turner, " Kia-Ora," Lake Cargelligo.
H. S. Barrow, Merriwagga.
G. Gow, " Hughendon," Barellan.
H. T. Manning, " Ravenstone," Barellan.
D. N. Johns, " Wollongough," Ungarie.
D. and J. Gagie, " Spy Hill," West Wyalong.
P. Corcoran, " Weeroona," Moombooldool.
M. McCrone, " Bungambil," Mirrool.
Hobson Bros , " Glen-lea," Cunningar.
R. H. Thackeray, " Woomack," Young.
D. S. Adamson, " Mindarie," Dirnaseer.
S. Kanaley, " Lynton," Junee.
H. Rumble, " Carinya," Muttama.
H. V. May, " Caithness," Junee.
T. J. Fitzpatrick, " Erin Vale," Warre Warral.

Wheat trials sown on the properties of Messrs. Circutt, Turner, Barrow, and Gow, were complete failures, due to the dry season. Oat trials conducted by Messrs. May and Fitzpatrick on stubble land failed from an experimental point of view, the plots being cut for hay, because of the prevalence of weed growth.

The Season.

Seasons in which an ample and favourably distributed, but not excessive, rainfall occurs are seldom experienced. The 1927 season was no exception. It was noted for the sparsity of the autumn and winter precipitations, and for cold frosty weather, followed by a very favourable spring rains. Over a large portion of the western section of the district droughty conditions prevailed and crop failures and partial crop failures were general. In the more easterly section of the district, the rainfall, though considerably below the average, was sufficient to ensure satisfactory returns on fallowed land.

From the commencement of the year few effective rains fell, and by seeding time the majority of fallows lacked consolidation of the sub-surface soil, and were in a dry state. Most centres recorded light showers in April, and in May a general break occurred in the weather, the falls ranging from 83 points at Ungarie to 247 points at Muttama. This proved sufficient to ensure a satisfactory germination of all plots sown, and enabled the remaining experiment areas to be planted with safety. Throughout June and July only light, scattered showers were recorded, and in August and the greater part of the month of September the rainfall, owing to its incidence, was practically of no value. Heavy and frequent frosts occurred during this period and checked growth. Because of the very low reserves of moisture in the soil, it was during this period that the crops suffered severely and burnt off badly.

The position by the end of September looked almost hopeless, but fortunately, heavy soaking rains fell, and were followed by additional favourable rains during October. Later districts benefited from further showers early in November. These rains coming at a most critical period, effected a wonderful change in the crops, transforming some from practically complete failures to 10- and 12-bushel crops. Light sandy loams showed to advantage, making greater use of the limited amount of moisture available. In the Cargelligo-Hillston division the winter precipitation was insufficient to induce germination and the favourable spring rains, from a cropping standpoint, were of little use.

RAINFALL Registrations.

Month.	Mirrool.	Ungarie.	Barellan.	Moombooldool.	West Wyalong.	Young.	Junee.	Dirnaseer.	Muttama.	Cunningar.
1926—	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
July	93	46	149	138	88	207	189	218	193	191
August	134	71	218	189	153	86	183	276	274	203
September ...	45	70	22	213	205	42	128	122	214	313
October	77	22	127	91	41	108	193	101	176	141
November ...	21	Nil	11	17	5	14	18	25	54	42
December ..	74	240	179	112	11	115	109	179	157	288
1927—										
January	28	130	25	40	209	242	130	250	400	226
February ...	22	Nil	25	39	5	Nil	46	42	34	94
March	Nil	72	Nil	16	12	34	Nil	3	12	37
Total Fallow period	494	651	756	855	728	848	996	1,216	1,514	1,535
April	58	66	40	39	104	Nil	77	65	54	56
May	87	83	116	93	126	178	181	189	241	221
June	41	89	49	50	101	66	83	89	79	89
July	109	35	120	117	45	164	128	140	163	192
August	68	42	87	78	72	83	181	153	147	160
September ...	45	145	70	117	317	168	191	29	110	57
October	315	219	226	227	127	210	167	319	246	296
Early November	...	...	...	...	...	240	...	...	230	210
Total Growing period	723	679	708	721	892	1,109	1,018	984	1,270	1,281
Grand Total ...	1,217	1,330	1,464	1,576	1,620	1,957	2,014	2,200	2,784	2,816

Cultural Details.

Barellan (H. T. Manning).—Medium red loam; eight crops grown previously; mouldboard ploughed 4 inches July; harrowed October and March; insufficient rain during fallowing period to warrant further cultivation; fallow lacking in consolidation; combine sown 7th May on a dry seed bed at the rate of 70 lb. seed and 84 lb. superphosphate. Wheat died back during September, due to lack of moisture. Flag smut was prevalent, particularly in Federation. Harvested 20th December.

Ungarie.—Dark red heavy loam (boree country), with stiff clay subsoil; horse paddock for thirty years; first crop 1925; scarified February; spring-toothed April; scarified end of July; mouldboard ploughed 3½ inches end August; scarified December and April; fallow in excellent order at seeding;

sown with disc drill, 28th and 29th April on a seed bed sufficiently moist to induce germination; 65 lb. seed and 56 lb. superphosphate. Harvested 1st and 2nd December; October rains too late to be of very great assistance.

West Wyalong.—Dark brown heavy loam with stiff clay subsoil; mouldboard ploughed 4 inches August, springtoothed October and January; cultipacked April; sown with hoe drill, 29th and 30th April on an excellent and moist seed bed, at the rate of 75 lb. seed and 84 lb. superphosphate. Harvested early December. Early growth outstanding. Wheats too far advanced to derive much benefit from late rains. Flag smut prevalent; Waratah bad.

Moombooldool.—Light sandy (red) mallee with firm gravelly subsoil; eight crops grown previously; mouldboard ploughed 3 inches July; springtoothed October and February; fallow in good condition (won Barellan fallow competition); sown with combine in a moist seed bed on 14th May at the rate of 65 lb. seed and 1 cwt. superphosphate. Harvested early December. Yields of Federation reduced by very heavy infestation of flag smut.

Mirrool.—Brown, light to medium textured loam, with clay subsoil; fifteen previous crops; springtoothed January; mouldboard ploughed 4 inches June; springtoothed full depth September; springtoothed January and April; harrowed May; seed-bed lacking in consolidation; sown with disc drill in an uncertain seed-bed on 11th May, at the rate of 70 lb. seed and 84 lb. superphosphate. Wheat died back in September, but shot again with October rains. Harvested 23rd December; yield of Ghurka reduced 30 per cent., due to extreme toughness.

Cunningar.—Light brown light friable loam, with medium heavy subsoil of granite derivation; cropped for forty-five years; mouldboard ploughed 4½ inches September; springtoothed to full depth December; harrowed March; springtoothed April and May; sown with disc drill in a moist seed bed on 19th May at rate of 77 lb. seed and 84 lb. superphosphate. Harvested 20th December. Yields of Waratah and Bena reduced by shelling.

Young.—Light medium textured light brown loam; mouldboard ploughed 4½ inches August; harrowed October; scarified November and February; springtoothed and harrowed May; sown with hoe drill in a moist seed bed on 18th May, at the rate of 80 lb. seed and 84 lb. superphosphate; fed off heavily in June and July; early varieties in comparison to later varieties would probably have shown to better advantage sown later.

Dirnaseer.—Medium to heavy textured red loam, with clay subsoil; cropped for twelve years; previous crop oats; mouldboard ploughed 3½ inches July; springtoothed to full depth October; harrowed December; springtoothed January; sown with combine in moist seed bed on 14th May, at the rate of 75 lb. seed and 84 lb. superphosphate; low yields due to unfavourable spring and heavy weed growth.

Junee.—Friable medium red loam; cropped for eight years; mouldboard ploughed 4½ inches July; harrowed August; scarified (deep) October; spring-toothed January; scarified 14th and 24th May; sown with disc drill in a moist seed bed on 24th May at the rate of 65 lb. seed and 84 lb. superphosphate.

Muttama.—Light brown, friable light-textured loam; cropped eight years; mouldboard ploughed 4½ inches September; harrowed September; spring-toothed December; disced February; harrowed May; seed bed uneven, due to discing. Sown with disc drill in a moist seed bed on 21st May at the rate of 75 lb. seed and 84 lb. superphosphate; yields reduced due to prevalence of weed growth.

Diseases.

The only disease to cause any serious reduction in yield was flag smut Trials at all centres were affected to a greater or less extent, but those in the western section were by far the worst. Dry sowing and the low winter rainfall no doubt were responsible. Flag smut spores germinating at the same time as the wheat, which was lacking in vigour, owing to the limited moisture supply, resulted in heavy infection. Ghurka and Nabawa showed considerable resistance to flag smut. On the lighter textured soils, flag smut was decidedly more in evidence than on the heavier types of soil. Heavy manuring, by imparting more vigour to the crop, tended to minimise the disease.

RESULTS of Variety Trial.

Variety.	Barellan.	Ungarie.	West Wyalong.	Moombooldool.	Mirrool.	Cunningar.	Young.	Dirnaseer.	Junee.	Muttama.*
	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.
Bena...	6 0	...	8 39	...	11 25	30 49	23 52	13 50	...	24 0
Binya	5 10	...	7 3	..	...	...	...	...	...	...
Boolaroo	...	..	...	...	12 6	...	..	..	..	...
Currawa	..	...	...	18 54	...	...	...	..	...	...
Duri	...	...	9 20	..	...	...	23 25	...	...	24 24
Duchess	..	...	...	...	...	...	26 31	...	26 16	...
Gluyas	...	9 20	..	...	..	...	..	...	...	...
Ghurka	...	10 1	10 21	20 23	8 25	...	19 45	...	22 49	...
Marshall's No. 3	..	.	...	..	...	...	...	10 20	...	...
Nabawa	...	11 40	...	...	14 40	...	...	...	28 0	...
Nizam	6 50	..	9 24	..	...	...	...	...	...	...
Penny	...	...	...	21 56	...	...	...	...	...	...
Pusa	...	...	...	..	...	...	...	...	...	...
Ranee	...	9 29	...	...	..	...	...	...	17 35	...
Turvey	...	...	...	.	..	33 17	27 31	...	26 42	24 30
Union	5 56	11 50	...	..	13 27	...	...	16 45	...	...
Waratah	6 5	11 48	8 55	15 31	13 2	29 58	23 44	10 20	30 17	20 38
Yandilla King	...	...	...	...	...	32 54	30 19	...	..	21 32
Federation ...	5 20	10 39	...	11 20	12 36	...	...	...	...	...

* In addition to the above Canberra at Muttama yielded 19 bushels 13 lb.

Notes on Variety Trials.

From the point of view of testing out flag smut resistance the past season was excellent. Nabawa and Ghurka were highly resistant, and both gave very satisfactory yields. Trouble was experienced at Mirrool in stripping Ghurka, owing to toughness, as was indicated by the number of imperfectly

thrashed ears passing through the header. At other centres little difficulty was experienced in this respect. Yandilla King sown under favourable conditions was comparatively free from infection. In the later districts it still continues to hold pride of place.

Owing to the low yields at many centres, differences between varieties are not very marked. However of the newer varieties, Nabawa, Ghurka, Duri, and Nizam are the most promising, and will be tested again. In the more favoured centres, Duchess is worthy of further trial. A little shelling occurred, Bena and Waratah being the worst offenders. For the season excellent yields were obtained on mallee country, but varieties subject to flag smut were disappointing.

RESULTS of Fertiliser Trials.

	Barellan.	Ungarie.	West Wyalong.	Moombooldool.	Mirrool.	Cunningar.	Young.	Dirnaseer.	Junee.	Muttama.
Variety.	Federation.	Federation.	Waratah.	Federation.	Federation.	Yandilla. King.	Yandilla King.	Waratah.	Waratah.	Canberra.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate "H.G."—										
42 lb.	4 25	...	7 53	...	...	...	...	...	...	...
56 lb.	...	10 39	...	...	12 1	32 56	25 58	10 15	...	18 25
67 lb.	5 30	...	9 34	...	...	...	...	...	...	...
84 lb.	5 20	12 37	...	...	12 36	32 54	30 19	10 20	30 17	19 13
112 lb.	6 23	12 5	...	11 26	13 4	32 47	33 37	11 0	32 51	20 54
150 lb.	...	...	...	13 1	...	...	...	...	...	...
200 lb.	...	...	...	18 55	...	...	...	...	...	...
Superphosphate 54 lb., Sulphate of ammonia 27 lb. ...	...	...	...	12 20	...	..	...	...	...	...
Superphosphate Standard—										
56 lb.	...	...	7 43	...	...	...	...	...	...	...
84 lb.	...	...	8 55	...	...	...	...	...	...	...
112 lb.	...	...	8 41	...	...	...	...	...	...	...
Ephos phosphate 42 lb.	...	...	4 46	...	...	...	...	...	...	...
Raw rock phosphate 37 lb. ...	...	...	5 8	...	...	...	...	...	...	...

Manurial Trials.

Manurial trials were conducted at all centres, and in many instances the heavier dressings of superphosphate were outstanding. Some farmers contend that in a dry year superphosphate tends to burn off the crop, but the above results indicate that even in a year of low rainfall judicious applications of superphosphate are payable. In the drier section of the district 67 to 84 lb. superphosphate gave best results. At Young 1 cwt. superphosphate compared with 56 lb. increased the yield by 7½ bushels. At Moombooldool, with a low rainfall, on light sandy mallee country, 200 lb. superphosphate gave an increased yield of 7½ bushels compared with a dressing of 112 lb. In the last instance the increased yield may be partly attributed to the greater vigour imparted to the crop, susceptibility to flag smut being thereby reduced. Results obtained from Ephos and raw rock phosphate indicate that they are of little value for fertilising wheat.

The Transit of Lambs to Market.

Loss of Weight in Trucks.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

In the year 1926 an experiment was conducted in connection with this matter, and only the difference in live weights as between the farm and the Flemington yards was recorded. With the idea of determining what proportion of that weight was actual loss of flesh, the experiment was carried out in further detail during 1927, the dressed weights being taken of lambs slaughtered on the farms for comparison with others slaughtered at Flemington. Three centres were chosen, varying in distances from Flemington, viz., Cowra, Yanco, and Bathurst Experiment Farms. In each case twelve lambs were selected and suitably marked. Of these, nine were weighed and trucked on the farms and again on arrival at Flemington. The remaining three of the twelve were retained on the farms and were also weighed and then slaughtered, dressed and weighed there, while three out of the nine forwarded to Flemington were slaughtered, dressed and weighed there.

The results obtained at the three farms are stated separately, and for convenience they are arranged in the following groups :—

Group 1.—Nine lambs, live weights of which were ascertained at farms before trucking, and at Flemington, ex trucks.

Group 2.—Three lambs, live weights of which were taken at farms, after which they were slaughtered and dressed weights were recorded.

Group 3.—Three lambs from the nine forwarded to Flemington were slaughtered there and the dressed weights recorded.

The dressed weights mentioned throughout this experiment refer to the "hot weight," less head, skin, offal, &c.

Cowra Experiment Farm.

The details as to the forwarding of the lambs from the farm were as follows :—

Time of mustering—11·30 a.m., 1st November, 1927.
Lambs weighed at farm—4 p.m., 1st November, 1927.
Nine lambs trucked—10 a.m., 2nd November, 1927.
Nine lambs arrived at Flemington—7 a.m., 3rd November, 1927.
Nine lambs weighed at Flemington—9 a.m., 3rd November, 1927.

Three lambs slaughtered at farm—5 to 6 p.m., 1st November, 1927.
Three lambs slaughtered at Flemington—2 p.m., 3rd November, 1927.

Each lamb was tagged so that it could be traced at Flemington, and the following table shows the various weights of each animal:—

Number of Lamb.	Live Weights at Cowra.	Live Weight at Flemington.	Dressed Weights at Cowra.	Dressed Weights at Flemington.
	lb	lb	lb	lb
341	78	71	...	...
342	75	71	..	...
343	84	76	...	...
344	87	78	...	...
345	77	73	...	...
346	84	80	...	...
347	76	71	...	35
348	82	74	...	38
349	75	67	...	34
350	85	...	40	...
351	84	...	40	...
352	74	...	34	...

The average weights, loss in transit, and loss in dressed weights are shown in the following table :—

	lb
Group 1 —	
Average live weight at Cowra	79·77
Average live weight at Flemington...	73·44
Average loss of live weight in transit	6·33
Group 2—	
Average live weight at Cowra	81
Average dressed weight at Cowra	38
Average loss	43
Group 3—	
Average live weight at Cowra	77·26
Average dressed weight at Flemington	35 66
Average loss	41·6

Yanco Experiment Farm.

The details regarding the weighing, trucking, &c., of the lambs at this farm were as follows :—

Time of mustering—10 a.m., 14th November, 1927.
Lambs weighed at farm—1 p.m., 14th November, 1927.
Nine lambs trucked—2 p.m., 14th November, 1927.
Nine lambs arrived Flemington—5 a.m., 17th November, 1927.
Nine lambs weighed at Flemington—9 a.m., 17th November, 1927.

Three lambs slaughtered at farm—4 p.m., 14th November, 1927.
Three lambs slaughtered at Flemington—2 p.m., 17th November, 1927.

The following table shows the weights of the lambs at Yanco and at Flemington :—

Number of Lamb.	Live Weight at Yanco.	Live Weight at Flemington.	Dressed Weight at Yanco.	Dressed Weight at Flemington.
	lb.	lb.	lb.	lb.
2	61	51	...	...
3	58	52	...	23
4	69	59	...	...
5	72	62	...	...
6	56	47	...	...
7	67	56	...	26
9	64	57	...	25
10	60	52	...	...
11	62	54	...	...
12	64	...	30	...
13	57	...	26	...
14	62	...	29	...

The average weights, loss in transit, and loss in dressed weights are shown in the following table :—

	lb.
Group 1—	
Average live weight at Yanco	63·22
Average live weight at Flemington	54·44
Average loss of live weight in transit	8·78
Group 2—	
Average live weight at Yanco	61
Average dressed weight at Yanco	28·33
Average loss	32·67
Group 3—	
Average live weight at Yanco	63
Average dressed weight at Flemington	24·66
Average loss	38 34

Bathurst Experiment Farm.

At Bathurst a similar trial was conducted, but owing to a misunderstanding, the lambs were not tagged with numbered tags, with the result that individual animals could not be identified at Flemington. However, the average weights were given in each case, and although perhaps not quite as accurate as the figures quoted at the other farms, they serve as an indication.

The details as to the forwarding of the lambs from this farm were as follows :—

Time of mustering—5 p.m., 20th December, 1927.
Lambs weighed at farm—9 a.m., 21st December, 1927.
Nine lambs trucked—11 a.m., 21st December, 1927.
Nine lambs arrived at Flemington—6 a.m., 22nd December, 1927.
Nine lambs weighed at Flemington—9 a.m., 22nd December, 1927.
Three lambs slaughtered at Bathurst—5 p.m., 21st December, 1927.
Three lambs slaughtered at Flemington—2 p.m., 22nd December, 1927.

The following table shows the weights of the lambs at Bathurst and at Flemington:—

Live Weights at Bathurst.	Live Weights at Flemington.	Dressed Weights at Bathurst.	Dressed Weights at Flemington.
lb.	lb.	lb.	lb.
65	...	30½	...
67	...	29	...
66	...	32	...
65	58	...	25
61	55	...	25
61	59	...	27
60	57	...	...
67	55	...	...
64	54	...	...
62	55	...	...
61	61	...	...
60	66	...	...

The figures shown in the second and fourth columns of the above table do not necessarily refer to the same individuals as in the first and third columns. As previously explained, the individual lambs from Bathurst could not be traced at Flemington.

The average loss of weight in transit is shown herewith:—

	lb.
Group 1—	
Average live weight at Bathurst	63·3
Average live weight at Flemington	56·6
Average loss of live weight in transit	5·7
Group 2—	
Average live weight at Bathurst	66
Average dressed weight at Bathurst	30·5
Average loss	35·5
Group 3—	
Average live weight at Bathurst	62·3
Average dressed weight at Flemington	25·6
Average loss	36·7

Summary.

The following table summarises the results obtained at the three farms, and shows the percentage loss in each case:—

Farm.	Rail Mileage.	Loss in live weights. (Group 1.)		Loss in dressed weights. Group 2.		Loss in dressed weights. Group 3.	
		Average loss.	Percentage.	Average loss.	Percentage.	Average loss.	Percentage.
		lb.		lb.		lb.	
Cowra	227	6·33	7·93	43	53·1	41·6	53·9
Yanco	374	8·78	13·88	32·67	53·56	38·34	60·86
Bathurst	149	5 7	9·14	35·5	53·79	36·7	58·91

Destruction of Rabbits with Carbon Bisulphide.

S. L. BLACK, M.R.C.V.S., Government Veterinary Surgeon.

ON 8th November, 1927, the writer visited Camden and there witnessed a demonstration of the fumigation of rabbit burrows with carbon bisulphide. The demonstration was carried out on hilly chocolate soil country. Some live rabbits had been previously caught, and these were liberated into the first two burrows, eight into No. 1 and six into No. 2, each rabbit into a different hole.

Burrow No. 1.—Spread 42 feet by 36 feet, and number of holes, thirty-two; some of the outlets on first examination only showed one opening, but as the soil was dug away two, three, and four holes were observed in some of these, all leading into one external opening, and the number thirty-two above represents the aggregate.

The fumigation of No. 1 was commenced at 10.5 a.m. and completed at 10.48 a.m., the fumigator during this time having been changed to eight different holes. Each opening was closed up as soon as, but not until, "pulsations" of smoked appeared there. The quantity of carbon bisulphide used was 2½ lb., and the time taken to fumigate 43 minutes.

At 12.30 p.m. (approximately two hours after the fumigation of No. 1 was completed), two men commenced digging out this burrow. After working for about fifteen minutes a dead rabbit was dug out, and some minutes later a second one, also dead, was unearthed. A quarter of an hour later a third rabbit was dug out. This one was not dead, but so far gone that there appeared to be practically no hope of its recovery, and it was put into the shade in order to see whether under favourable conditions it would recover. By the time the digging out of No. 1 burrow was completed five more rabbits, all dead, had been dug out, so it was apparent that this warren was empty before the demonstration. Three of the rabbits were found in "blind ends," and the remainder in open channels at different parts of the warren. The deepest portion of the burrow was slightly over 2 feet, but it was double-storeyed in places, and one or two rabbits were found in the lower storey. A smell of carbon bisulphide was noticed right through during the digging operations.

Rabbit No. 3 remained in a comatose condition for fifty minutes after its removal to the fresh air, for the first part of which time its breathing was entirely oral and very infrequent. An hour after being dug out it was able to move the head and ears only, but half an hour later it could sit up in normal "rabbit" posture, although unable to stand. It remained in that condition until 4.30 p.m., when it was put under a box with some lucerne and water to observe what would be its condition by next day. On the following day it was found to be dead.

Burrow No. 2.—Spread 27 feet by 12 feet, and number of holes thirteen. The time taken to fumigate was fifteen minutes, during which time the fumigator was changed four times. The amount of carbon bisulphide used was 1 lb. The burrow was inspected next day, but none of the holes had been opened.

Burrows Nos. 3 *and* 4.—These two burrows took thirty-two minutes to fumigate, and 3 lb. of carbon bisulphide was used; the separate time and amount for each was not observed. The spread of No. 3 was 27 feet by 18 feet, and the number of openings twenty-six, and in the case of No. 4 the spread was 39 feet by 27 feet, and the number of outlets twenty-one. Before commencing to fumigate, a rabbit was seen to enter No. 4. None of the holes were opened on examination next day.

Burrow No. 5.—Spread 66 feet by 39 feet, and number of holes fifty-two. This burrow was in the form of a double warren, the two portions communicating by what appeared to be a long single channel. A rabbit was also seen to enter this burrow. None of the holes were found to be opened up on examination next day.

Burrow No. 6.—Spread 33 feet by 18 feet, and containing twenty-three holes. No holes were found to be opened on examination next day. Five pounds of carbon was used on Nos. 5 and 6.

The fumigation of the six burrows was completed at 4.30 p.m. Three men were employed at the first two, but at the remaining burrows two men did the work. During the day a gallon tin of carbon bisulphide was used, which by weight worked out at 11½ lb. In addition to the carbon, what is termed a "smoke mixture" is also used in the fumigator, the sole use of which is to make the fumes visible. It is understood that prior to fumigation rabbits had been seen in large numbers round some of these warrens.

A communication dated 15th November, 1927 (a week after date of fumigation), received from the owner of the property on which the demonstration was conducted, advised that the burrows still remained unopened.

Essentials to Clean Milk

THE following measures are necessary for the successful production of clean milk:—

(*a*) A full knowledge of correct methods in the cowshed and farm dairy;
(*b*) the presence of an adequate water supply for the cowshed and dairy;
(*c*) intelligent labour;
(*d*) covered pails;
(*e*) the provision of simple, but adequate sterilising equipment;
(*f*) the maintenance of interest and pride in the work by adequate incentive and reasonable working conditions;
(*g*) adequate personal supervision and co-operation between employers and employees.

—R. B. FORRESTER, in "The Fluid Milk Market in England and Wales."

Sheep Classing.

Better Flocks Mean Bigger Returns.

E. A. ELLIOTT, Sheep and Wool Expert.

Sheep classing is the operation of grading the breeding flock and selecting the sires for use in mating, the object being to gradually raise the standard of the whole flock. The practice is an annual one on all stud properties, or where large numbers of ewes are bred from each year, and it is often done by recognised sheep classers who do nothing else than class the sheep of different properties each year, and perhaps select rams suitable for use in the flocks concerned.

Pays Even with Small Flocks.

Sheep classing, however, should not be confined to the larger flocks. In every flock, no matter how small, there is room for improvement, and on account of the casual methods by which many flocks are built up the need is usually very great. The man who only requires a small breeding flock is at a disadvantage because station owners and managers do not like selling small lines of sheep, and he is forced to accept what he can get. Then again he may not have sufficient funds to procure a good even line of ewes. Unfortunately, too, there are some flock owners who, when buying rams, take the lowest priced animals without considering whether they will help to "make" or "mar" their flocks.

It is recommended, therefore, that every owner of a flock of sheep should class his ewes at least to the extent of culling out all the low grade animals. In this operation wool must not be the only consideration. In flocks which are used primarily for fat-lamb production, size of frame, roominess in girth and hindquarters, good milk-producing qualities, and early maturity are points of importance, and all ewes lacking these qualities to any extent should be eliminated from the breeding flock. At the same time, these being days of good wool prices, the wool side must not be lost sight of, as a ewe can raise a satisfactory fat lamb and still produce a payable fleece of wool.

The best time to class the flock is just prior to shearing, as the sheep are then carrying full evidence of their value as producers of wool. It is hardly necessary to say that sheep classing is impossible after the wool has been removed, although it is quite possible to carry out the job any time after the sheep are carrying seven or eight months' wool.

Breeding Merinos for Wool.

The small flock owner who is breeding for wool should have an ideal in his mind. He must have in view the sheep that will grow the type of wool most payable and best suited to the district, and he will find it worth

while to acquaint himself with the views of those who have had longer experience as to most satisfactory type of wool to grow under local conditions. Having thus got his ideal before him, he should keep it steadily before him, striving each year when classing his sheep to bring the flock nearer the ideal by culling out all ewes that vary greatly in any of the essential qualities. The important qualities to consider are a well-shaped frame, considering the type and breed, good legs (not crooked), and wool of the desired quality (fineness), and as even and dense as possible all over the body. Regarding the frame, it may be remarked that if the flock is of Merino breed, it is not necessary to have quite such a shapely carcase as with the mutton breeds.

The most common faults are small, undersized, or weedy frame, a dip behind the shoulders called "devil's grip" (a sign of weak constitution), narrow shoulders or hips, and crooked legs or feet. Common faults in the wool growth which should also be avoided are unevenness over the body, lack of density or length, and dullness or dinginess in colour due to too much condition or to an undesirable type of yolk. There are other wool characteristics and faults which should be considered, but those mentioned are the most important.

What Proportion to Cull.

The proportion to be culled out will depend on the evenness of the foundation flock, and how drastic the owner is prepared to be. After the first culling, there will be not so many to remove from the original lot of ewes, although it will be advisable to examine the flock each year, as some animals may deteriorate quickly. As soon as the teeth become faulty it is well to cull such sheep out on account of age—"cast for age" as it is termed. The class of country and the amount of risk the owner is prepared to run if a dry season follows will decide at what stage it is wise to cull for age. Under dry condition the aged ewes, especially if in lamb, are naturally the first to feel the pinch.

Each year the ewe hoggets will come up for inspection, and here judgment is required. On numbers of station properties, as high as 33 per cent. of the ewe hoggets are culled each year. This keeps the flock at a high standard and allows for a percentage of the cull hoggets to be fairly attractive and worth good prices in the market as breeders. When classing, the fact that the ewes are rearing lambs must be considered, as ewes with lambs at foot cannot be expected to be in the pink of condition; they should not, therefore, be culled because of lack of condition alone. If hoggets have encountered severe conditions after being weaned they may not be well grown, and it may be advisable to hold them over till a later period before passing judgment upon them. When culled for any reason except for age, a distinguishing mark should be put in the plain ear so that they can be easily recognised in the yards, and on no account should they be bred from, as their faults are likely to be intensified in the progeny. The wisest plan is to try to fatten all the culls and dispose of them to the butcher at the earliest opportunity.

Comebacks and Crossbreds.

In a flock of comebacks, if breeding for wool the procedure would be similar to that described above, except that care should be taken that the size of frame necessary in a sheep of this type is not sacrificed to the production of a superfine class of wool. If the comeback flock is used for lamb raising, the points mentioned earlier (roominess of frame, milk production, and early maturity) need to be considered.

These remarks concerning frame and conformation apply equally to a crossbred as to a comeback flock, though to a lesser degree. The main consideration in regard to the wool is to make the flock as even as possible, and because of the greater value attaching to the finer classes of crossbred wool, it is advisable to cull the coarser woolled animals with the object of getting a flock that will cut a fairly even clip of medium to fine crossbred wool.

The Ram.

In selecting the ram for wool-growing purposes, the small flock owner is advised to go to some reputable breeder where he can be sure of procuring a pure bred animal. If he is satisfied with his purchase—satisfied that improvement is being made in his flock by the introduction of this particular type—he should continue to use the same strain, as he will not get such even results if he buys from different studs even though the animals are apparently similar in shape, class of wool, &c. When buying a ram, or rams, it is well to have in mind the type of the ewes that it is intended to breed from, especially any faults or weaknesses they possess, for these may be corrected in the progeny by the judicious selection of a ram strong in those points in which the ewes are weak. For example, if the ewes are lacking in density, a ram with plenty of density should be selected.

It is recognised that numbers of smaller flock owners are not too clear as to the methods they should adopt in sheep classing, and cannot afford to employ a recognised sheep classer. In view of this the officers of the Sheep and Wool Branch of the Department are prepared to assist owners in this work without any fee. All that is necessary is to apply to the Under Secretary giving at least six weeks' notice of the date it is desirable for the officer to visit the property. If more than one farmer in the district requires help of this nature, a joint application could be arranged, as it is obviously better for an officer to spend a week doing three or four flocks, than to visit the district on three or four different occasions to see one flock each time.

The Relation of Humus to Fertility.

The effect of humus upon soil texture is not only its most important function, but is one which cannot be performed by any other substitute; it is not too much to say that the fertility of a soil depends primarily upon its content of organic matter and that when agriculturists refer to a soil as being "in good heart," they mean that it contains sufficient humus to secure fertility.—C. M. Hutchinson, in the *Agricultural Journal of India.*

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	G. C. Chapple, "Ondiong," King's Vale. H. J. Harvey, Kindalin, Dubbo. T. Jones, Birdwood, Forbes. Hobson Brothers, Glenlea, Cunningar. N. C. Fitzpatrick, Erin Vale, Warre Warral. R. A. Harricks, Horseshoe Vale, Dubbo. W. J. Coddington, Granite View, Murrumburrah. N. G. Bourchier, Deniliquin-road, Finley. Manager, Experiment Farm, Cowra.
Canberra	E. J. Johnson, "Iona," Gunningbland. Quirk and Everett, "Narrawa," Wellington. W. A. Southwell, Wilgrove, Galong. G. C. Chapple, "Ondiong," King's Vale. H. J. Harvey, Kindalin, Dubbo. T. Jones, Birdwood, Forbes. W. G. Law, Wattle Park, Armatree. W. R. Carter, Allambie, Narromine. Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Bathurst.
Clarendon	E. J. Johnson, "Iona," Gunningbland.
Cleveland	W. Burns, Goongiwarrie, Carcoar.
Currawa	Quirk and Everett, "Narrawa," Wellington.
Duri	R. Penfold, "Edaville," Quandialla.
Federation	E. J. Johnson, "Iona," Gunningbland. H. Owen, "Apple Grove," Duri. E. K. King, Karrindee, Uranquinty. W. G. Law, Wattle Park, Armatree. W. R. Carter, Allambie, Narromine. R. A. Harricks, Horseshoe Vale, Dubbo. A. Milgate, Trundle Road, Parkes. W. A. Glenn, "Maneroo," Thyra-road, Moama. N. G. Bourchier, Deniliquin-road, Finley. Manager, Experiment Farm, Temora. Manager, Experiment Farm, Bathurst.
Firbank	Manager, Experiment Farm, Trangie.
Florence	Manager, Experiment Farm, Trangie.
Gresley...	E. J. Johnson, "Iona," Gunningbland. H. J. Harvey, Kindalin, Dubbo. Manager, Experiment Farm, Temora.

Wheat—continued.

Hard Federation	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Bathurst.
Improved Steinwedel ...	Manager, Experiment Farm, Trangie.
Major	E. K. King, Karrindee, Uranquinty.
Marshall's No. 3	A. E. Kingham, Farm 1445, Murrami.
	W. G. Law, Wattle Park, Armatree.
	B. J. Stocks, Linden Hills, Cunningar.
	J. Berney, Eurimbla, Cumnock.
Merredin	T. W. O'Brien, "Cooberang," Junee Reefs
Nabawa...	Cullen Bros., Bunglegumbie, Dubbo.
	H. J. Harvey, Kindalin, Dubbo.
Nizam	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	N. G. Bourchier, Deniliquin-road, Finley.
Riverina	Quirk and Everett, "Narrawa," Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	W. G. Law, Wattle Park, Armatree.
Turvey...	Quirk and Everett, "Narrawa," Wellington.
	E. A. Michael, Hill View, The Rock.
	Watt Brothers, "Fairy Mount," Cumnock.
	T. M. Slattery, Mirrool.
	H. J. Harvey, Kindalin, Dubbo.
	Hobson Brothers, Glenlea, Cunningar.
	W. G. Law, Wattle Park, Armatree.
	Hannett Bros., "Bonefor," Cunningar.
Union	H. J. Harvey, Kindalin, Dubbo.
Waratah	E. J. Johnson, "Iona," Gunningbland.
	P. Page, Duri.
	Quirk and Everett, "Narrawa," Wellington.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	W. J. McGrath, Avon, The Rock.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	G. G. Ballantine, "Clifton," Ariah Park.
	J. McGrath, "Berra Lea," Goonumbla.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	Chaffey Bros., Nemingha.
	Manager, Experiment Farm, Trangie.
	T. Jones, Birdwood, Forbes.
	H. J. Harvey, Kindalin, Dubbo.
	E. K. King, Karrindee, Uranquinty.
	Watt Brothers, "Fairy Mount," Cumnock.
	B. J. Stocks, Linden Hills, Cunningar.
	W. G. Law, Wattle Park, Armatree.
	W. R. Carter, Allambie, Narromine.
	W. J. Coddington, Granite View, Murrumburrah.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle Road, Parkes.
	J. Berney, "Kildara," *via* Cumnock.
	Manager, Experiment Farm, Temora.
Wandilla	Manager, Experimet Farm, Temora.
Yandilla King...	A. E. Kingham, Farm 1445, Murrami.
	P. Gaynor, "Underwood," Ariah Park.
	A. A. Groves, "Aberfeldie," Barmedman.
	Quirk and Everett, Narrawa, Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	G. C. Chapple, "Ondiong," King's Vale.
	Bradford Brothers, Nubba.
	H. J. Harvey Kindalin, Dubbo.
	Hobson Bros., Glenlea, Cunningar.
	T. M. Slattery, Mirrool.
	R. A. Harricks, Horseshoe Vale, Warre Warral.

Oats—	
Algerian	C. Bennett, Forbes Road, Cowra.
	J. Lyne, Farm 1636, Yenda.
Belar	C. Bennett, Forbes Road, Cowra.
Guyra	Manager, Experiment Farm, Bathurst.
Mulga	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	D. Shearer and Sons, Glendon, via Singleton.
White African...	Principal, H.A. College, Richmond.
Peas—	
Greenfeast	R. C. Howard, Huntley, *via* Orange.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
A. V. Chaffey, "Lilydale," Glen Innes	15	25 Feb., 1928
Walaroi College, Orange	4	3 „ 1928
Lunacy Department, Orange Mental Hospital	3	„ 1928
Australian Missionary College, Cooranbong	51	11 „ 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 „ 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 „ 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	70	16 „ 1928
Department of Education, Mittagong Farm Homes	30	22 „ 1928
Sacred Heart Convent, Bowral	11	23 „ 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 „ 1928
Dominican Convent, Moss Vale	4	24 „ 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	118	20 „ 1928
Marist Brothers' Training School, Mittagong	30	25 „ 1928
Blessed Chanel's Seminary, Mittagong	3	26 „ 1928
J. L. W. Barton, Wallerawang	16	11 Oct. 1928
King Bros., Hygenic Dairy Company, Casula, Liverpool ...	94	19 „ 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 „ 1928
Department of Education, Hurlstone Agricultural High School ...	33	10 „ 1928
Department of Education, Eastwood Home	16	16 „ 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 „ 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 „ 1928
Lunacy Department, Callan Park Mental Hospital	20	26 „ 1928
Miss Brennan, Arrankamp, Bowral	24	29 „ 1928
Department of Education, Yanco Agricultural High School ...	64	12 Jan., 1929
H. Doggrell, Leicester Park, Mittagong	63	6 „ 1929
New England Girls' Grammar School, Armidale	15	12 „ 1929
Lunacy Department, Kenmore Mental Hospital	99	17 Feb., 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 „ 1929

—MAX HENRY, Chief Veterinary Surgeon.

Registered Farm Produce Agents.

The following is a list of farm produce agents who had registered with the Department of Agriculture at 23rd February, 1928. Where not otherwise mentioned the address in each instance is Sydney :—

Allen, Stanley Victor ...	Fruit Exchange, Bathurst-street.
Argue, Roy (R. Argue & Co.) ...	48 City Fruit Markets, Hay-st.
Armstrong, Mark ...	No. 25 Stall, Vegetable Markets.
Ashbury, Percy Charles ...	The Exchange, Penrith.
Associated Growers' Selling Agency Ltd. ...	N.S.W. Fruit Exchange, Bathurst-street.
Australian Fruit and Produce Co. Ltd. ...	Fruit Exchange, Bathurst-street.
Baker, John Norman ...	City Municipal Markets.
Barnes, Herbert William ...	23 Liverpool-street.
Batchelor, Walter Francis (Batchelor, Son and Mitchell).	19 City Fruit Markets.
Beard, Alfred George ...	City Fruit Markets.
Bell, John (M. Walters & Co.) ...	N.S.W. Fruit Exchange.
Bennett, James Thompson ...	7-9 Municipal Poultry Markets.
Bidner, William Charles (Bidner Bros.) ...	Pultney-street, Taree.
Black, Henry George (H. Black and Son) ...	17 City Markets.
Black, Roy Everett (H. Black and Son) ...	17 City Markets.
Boot, William Alfred Sydney (Boot and Carter) ...	City Vegetable Markets, 12 Ultimo-road.
Boyd, William George Whitton (Boyd and Hanlon) ...	410–420 Sussex-street.
Bragg, Ronald Clive ...	Fruit Exchange, Barker-street.
Brien, Reginald ...	Municipal Vegetable Markets.
Bromley, William Ernest ...	City Fruit Markets.
Brown, Reginald James (R. J. Brown and Son) ...	18 Quay-street.
Brown, Francis Phillip (R. J. Brown and Son) ...	18 Quay-street.
Browne, Charles Percy (Chas. P. Browne & Co.) ...	123 Sussex-street.
Browne, Arthur Cornelius Edward (Chas. P. Browne & Co.).	123 Sussex-street.
Browne, Perry Robert Easton (Chas. P. Browne & Co.)	123 Sussex-street.
Bryant, George Edward (G. E. Bryant and Son) ...	170 Sussex-street.
Buhl, Frank John (Buhl and Hacking) ...	City Fruit Markets.
Byrne, Thomas ...	City Fruit Markets, Quay-street.
Byrnes, Joseph ...	No. 2 City Vegetable Markets.
Caines, William Charles ...	Steam-street, West Maitland.
Caldicott, William Henry (W. H. Caldicott and Son)...	City Markets, Quay-street.
Caldicott William Robert Ralph (W. H. Caldicott and Son).	City Markets, Quay-street.
Callcott, Percy Augustus (W. T. Callcott & Co.) ...	Peel-street, Tamworth.
Cameron and McFadyen Ltd. ...	143 Sussex-street.
Capon, Harry Thomas ...	City Vegetable Markets.
Caro, Leslie (Windows and Caro) ...	Fruit Markets, Quay-street.
Carter, William Henry (Hilton A. Kemp) ...	City Vegetable Markets, Hay-st.
Carter, John Henry (Boot and Carter) ...	City Vegetable Markets, 18 Ultimo-road.
Castley, Arthur Henry (Kerridge and McMahon) ...	171 Sussex-street.
Cates, Ernest Stanley ...	City Fruit Markets, Quay-street.
Chee, James ...	Municipal Markets, Sydney.
Cheshire, Walter Albert (W. Cheshire & Co.) ...	Southern Produce Market, 57 George-street, Parramatta.
Chew, Gock (Wing On & Co.) ...	Ultimo-road and Quay-street.
Chilton, Fred. ...	Store No. 10, City Fruit Markets.
Clarke, Harold Rupert (Clarke and Son) ...	City Vegetable Markets, Quay-st.
Clarke, Robert Hilton (Clarke & Son) ...	City Markets, Sydney.
Comino Bros. Ltd. ...	Municipal Fruit Markets.

Cook, Victor Roy	76 Hay-street.
Cooke, Edwin	No. 1 Market Store, Ultimo-road.
Cooper, Alfred John	Fruit Exchange.
Constantine, William	City Fruit and Vegetable Markets.
Craig, Walter Sydney (A. Mason & Co.)	Fruit Exchange.
Craven, Percy Edgar (T. W. Craven)	349 Sussex-street.
Crocker & Barrett Ltd.	173 Sussex-street.
Crowder, Arthur Beaumont (Thiessen and Crowder)...	City Markets, Quay-street.
Davis and Sons Pty. Ltd.	222 Sussex-street.
Denham, William Digby Towill (Denham Bros.) ...	361 Sussex-street.
Dening, Augustus (Dening Bros.)	Municipal Markets.
Dening, Charles (Dening Bros.)	Municipal Markets.
Dening, Seymour	City Markets.
Dent, ChristopherJohn Ironside (T. H. Dent and Sons)	151 Sussex-street.
Dent, Leslie Norman (T. H. Dent and Sons) ...	151 Sussex-street.
Dent, Thomas Henry (T H. Dent and Sons) ...	151 Sussex-street.
Dent, Rupert Octavius (T. H. Dent and Sons) ...	151 Sussex-street.
Devlin, Paul Roland (McKellar and Devlin) ...	Fruit Exchange, Bathurst-street.
Don, Alexander Swanson (Lloyd and Kemp) ...	Fruit Exchange, Bathurst-street.
Drane, William (Hanigan and Drane)	Municipal Markets.
Drew, Harrie (Drew, Brown and Drew)	197 Sussex-street.
Dunston, Bertram	Municipal Fruit Markets, Quay-st.
Eggins, Eldred James	Keen-street, Lismore.
Evans, Eric	City Markets.
Farnsworth, Robert Sydney	121 Sussex-street.
Fear, Hugh Rainor (Fear and Paulin)	City Fruit Markets, Quay-street.
Fife, Robert Reginald	High-street, Penrith.
Firth, Alfred (Stimson and Firth)	No. 4 Fruit Exchange.
Foley Bros. Ltd.	355 Sussex-street.
Fry, Horace Charles (Lord and Fry)	King and National Park streets. Newcastle.
Gibbs, Arthur Herbert (C. Gibbs and Son)	Fruit Exchange, Bathurst-street.
Gilbert, George Murdoch (William Inglis)	"Broughton House," 47 King-st,
Godbee, Sydney Percival (The Exchange Fruit Supply Co.).	16 Quay-street, No. 2 Market.
Goodfellow, James	Goodfellow'sAuction Mart,Bowral
Graham, Norman Stewart	N.S.W. Fruit Exchange.
Grainger and Falkiner Ltd.	John-street, Singleton.
Gray, Robert Francis (Robert Robinson & Co.) ...	145 Sussex-street.
Greentree, Albert Charles (H. J. and A. C. Greentree)	City Municipal Fruit Markets.
Greentree, Herbert James (H. J. and A. C. Greentree)	City Municipal Fruit Markets.
Hacking, Emanuel (Buhl and Hacking)	City Fruit Markets.
Hain, Frederick William (Swan, Murray and Hain) ...	Church-street, West Maitland.
Hanigan, Frederick Charles (Hanigan and Drane) ...	Municipal Markets.
Hanlon, Robert Hugh (Boyd and Hanlon)	410 Sussex-street.
Harris, Arthur Henry	City Fruit Markets, Quay-street.
Harris, Alice Ellen	Fruit Exchange, Bathurst-street.
Harrison, Frank Beresford (S. J. Harrison and Son) ...	Stand, Municipal Fruit Markets.
Harrison, Spencer Joseph (S. J. Harrison and Son) ...	Stand, Municipal Fruit Markets.
Hayes, Sydney Paul (Hayes & Co.)	196 Sussex-street.
Heaton, Richard Joseph	City Fruit Markets, Quay-street
High, Devaney George (D. G. High and Son) ...	N.S.W. Fruit Exchange, Bathurst-street.
High, Devaney William (D. G. High and Son) ...	N.S.W. Fruit Exchange, Bathurst-street.
Hill, Francis William	City Fruit Markets, Quay-street.
Hing, Spence Mah (Hop Lee & Co.)	9 Municipal Buildings, Ultimo-rd.
Hoban, Dennis Joseph	Nemingha.
Holden, Crawford	Vegetable Markets.
Hooke, Robert Lloyd Everard (Swan and Hooke) ...	Steele-street, Newcastle.
Howard, Alfred Alexander	Fruit Markets, Bathurst-street.
Howard, Thomas Samuel	Fruit Exchange, Bathurst-street
Hoy Ket (Sam Yick & Co.)	23 Lackey-street.
Humphries, Norman Eric Hawke	Laidlaw-street, Boggabri.

Hunter, James Wentworth (Hunter and Wild) ...	City Fruit Markets.
Inglis, William Roy (William Inglis)	"Broughton House," 47 King-st.
Inglis, William (William Inglis)	"Broughton House," 47 King-st.
Jackson, Benjamin John	George-street, Parramatta.
Jenkins, Ernest Aloysius (John Jenkins)	The Fruit Exchange, Bathurst-st.
Jenkins, George Edward (John Jenkins)	The Fruit Exchange, Bathurst-st.
Jenkins, John Albert (Jenkins and Londregan) ...	Fruit Markets, Haymarket.
Jenkins, Leslie James (John Jenkins)	The Fruit Exchange, Bathurst-st.
Jolly, James Edward (Neil, Jolly & Co.)	Fruit Exchange, Bathurst-street.
Jones J. & Co. Ltd.	191 Sussex-street.
Jones, David Mackie	Municipal Fruit Markets.
Jones, Richmond Clyde	Municipal Markets.
Jones, William Henry	Main-street, Mittagong.
Kellaway, Christopher G. (C. G. Kellaway and Son)	No. 25, City Fruit Market.
Kemp, Hilton Adolphus (Hilton A. Kemp)	City Vegetable Markets, Hay-st.
Kemp, Thomas John (Nutman and Kemp)	City Fruit Markets, Quay-street.
Kennedy, Francis Xavier (F. Kennedy and Sons) ...	Steam-street. West Maitland.
Kerridge, Walter Platts (Kerridge and McMahon) ...	171 Sussex-street.
Kerwick, Michael Vincent (John Rankin & Co.) ...	199 Sussex-street.
Kirkwood, John William	City Fruit Markets, Quay-street.
Lawless, Ernest Albert (Mitchell and Lawless) ...	New City Markets. Quay-street
Leuckel, George	Municipal Markets, Quay-street.
Lloyd, Francis Herbert (Lloyd and Kemp)	Fruit Exchange. Bathurst-street.
Lloyd, Allan Leslie (Moore and Lloyd)	N.S.W. Fruit Exchange, Barker-st
Lord, Henry (Lord and Fry)	King and National Park streets, Newcastle.
Loucy Pang and Samuel Wong Ltd.	215 Thomas-street.
Lovell, John Patrick (A. Marantelli & Co)	Fruit Exchange. Bathurst-street.
Lowney, Thomas Francis	368 Sussex-street.
Lee, Stanley William (Reedy and Lee)	City Markets Quay-street.
Londregan, William Rodger (Jenkins and Londregan)	Fruit Markets, Haymarket.
Lum George (Hie Lee & Co.)	92 Hay-street.
Lum Hook (Sam Yick & Co.)	23 Lackey-street.
Mackaness, James Vincent	171 Sussex-street.
Mackey, J. & Co., Ltd.	269-271 Sussex-street.
McHugh, T., Ltd.	103-105 Sussex-street.
McMahon, Herbert John (Bert McMahon)	Brisbane-street, Tamworth.
McMahon, Edward David (Kerridge and McMahon)	171 Sussex-street.
Magnus, James	City Municipal Markets, Quay-st.
Marantelli, Andrew (Marantelli & Co.)	Fruit Exchange, Bathurst-street.
Marsh, Andrew John (H. Walters & Co.)	N.S.W. Fruit Exchange, Sydney.
Mason, Edward Allan (A. Mason & Co.)	Fruit Exchange, Sydney.
Merrett, John Bouverie	25 Dixon-street.
Middleton, Alexander Stein (Middleton and Mayo) ...	City Fruit Markets, Quay-street.
Milne, Archibald Edwin Gordon (J. W. Bryant) ...	12 City Markets Quay-street.
Mitchell, Enoch (Mitchell and Lawless)	New City Markets, Quay-street
Mitchell, James Chenoweth (Mitchell Bros.) ...	Railway-crescent, Burwood.
Mitchell, Stephen (Mitchell Bros.)	Railway-crescent, Burwood.
Mitchell, Thomas Shapton	City Markets.
Molesworth, George Harrison	City Vegetable Markets, Hay-st.
Moore, Albert Edward (Moore and Lloyd)	Fruit Exchange, Barker-street.
Murray, Frederick Arthur	City Vegetable Markets, Hay-st.
Murray, Maria Elizabeth (Swan, Murray and Hain) ..	Church-street, West Maitland.
Musgrove, Walter Matthew (W. Musgrove and Son)	8 City Markets, Quay-street.
Noble, Francis Walter (Noble Bros.)	City Fruit Markets, Quay-street.
Noble, Albert James (Noble Bros.)	City Fruit Markets, Quay-street.
O'Donaghoe, Eleanor (M. Walters & Co.)	N.S.W. Fruit Exchange, Sydney.
Oxby, William (Walker and Oxby)	153 Sussex-street.
Parker, Edward William (Parker and Rein) ...	9 Ultimo-road.
Paulin, Thomas King (Fear and Paulin)	City Fruit Markets, Quay-street.
Peters, Thomas James (E. C. Stubbs)	City Fruit Markets, Quay-street.
Phillips, Alfred Daniel (Alf. Phillips & Co.)	121 Sussex-street.
Phillips, D. J. (Smith and Phillips)	Municipal Poultry Markets.
Pierce, William Harold (Veitch and Pierce)	43 City Fruit Markets, Quay-st.
Piggott, Constantine George	Fruit Exchange, Bathurst-street

Pogson, Stanley Hessel (Hopkins and Lipscombe) ...	Fruit Exchange, Bathurst-street.
Prescott Ltd.	365 Sussex-street.
Ralph, George (J. H. Ralph)	Wentworth-avenue, Parramatta.
Rankin, John (John Rankin & Co.)	199 Sussex-street.
Rankin, Thomas Patrick (John Rankin & Co.) ...	199 Sussex-street.
Reedy, James Adrian (Reedy and Lee)	City Markets, Quay-street.
Reid, Thomas (Roberts, Reid & Co.)	Municipal Poultry Markets.
Rein, Albert Victor (Parker and Rein)	City Vegetable Markets, Hay-st.
Ridge, Vincent	Municipal Fruit Markets.
Robards, Edward James	City Fruit Markets.
Roberts, Reginald John (Roberts, Reid & Co.) ...	9 Municipal Poultry Markets.
Rogers, Henry William Frederick	N.S.W. Fruit Exchange, Barker-st.
Rogers, Keith Edward Vyvyan (F. H. G. Rogers) ...	The Fruit Exchange, Sydney.
Roughley, Oliver Edwin	Fruit Exchange, Sydney.
Roughley, William Garfield (J. and G. Roughley) ...	Fruit Exchange, Sydney.
Rowland, Harrie (H. Rowland & Co.)	Kelly-street, Scone.
Sadler, Percy William (Watkins and Evans) ...	City Fruit Markets, Quay-street.
Scott, William Bismarck	Municipal Fruit Markets.
Scott, Andrew (McKellar and Devlin)	Fruit Exchange, Bathurst-street.
Sherwood, Leslie	City Fruit Markets.
Sim, Arthur Wong (Mow Sang & Co.)	Ultimo-road.
Small, Alick Oakes	City Markets, Quay-street.
Smith, John Thomas	Municipal Markets, Quay-street.
Smith, Charles (Thompson and Smith)	City Vegetable Markets, Quay-st.
Smith, Fred (Smith and Phillips)	Municipal Poultry Markets.
Smith, Gordon Reuben (Hopkins and Lipscombe) ...	Fruit Exchange, Bathurst-street.
Smith, Walter John	City Markets, Sydney.
Southern Produce and Live Stock Co. Ltd.	George-street, Parramatta.
Stanton, Ernest Thomas	Municipal Fruit Markets, Quay-st.
Stevens, Francis George (F. G. Stevens & Son) ...	3 City Fruit Markets.
Stevens, Francis James (F. G. Stevens & Son) ...	3 City Fruit Markets.
Sunnyside Orchards Ltd.	Batlow; 33 Ultimo-road, Sydney.
Swan, Ernest Twining (Swan, Murray and Hain) ...	Church-street, West Maitland.
Swan, Reginald Ernest (Swan and Hooke)	Steele-street, Newcastle.
Tasmanian Producers' Distributing Agency Ltd. ...	125 Sussex-street.
Terrey, Joshua	23 City Markets.
Terrey, Alexander	N.S.W. Fruit Exchange.
Thiessen, Noel David (Thiessen and Crowder) ...	City Fruit Markets, Quay-street.
Thompson, Leslie Foster	Municipal Fruit Markets.
Thompson, Harry Linden (Thompson and Smith) ..	City Vegetable Markets, Hay-st.
Trathen, James (Trathen and Hall)	Municipal Fruit Markets.
Trusty, William (Robert Robinson & Co.)	145 Sussex-street.
Turnbull, David Charles	City Fruit Markets, Quay-street.
Turnbull, Wilfred Ernest	City Fruit Markets.
Waddell, Albert William Augustus	Fruit Exchange, Sydney.
Walker, Albert George	142 Russell-street, Bathurst.
Walker, Aaron Hilton	City Fruit Markets, Sydney
Ward, Arthur Cecil	Municipal Markets.
Watkins, William Percy (Watkins and Evans) ...	City Fruit Markets, Quay-street.
Watt, Arthur William (Watt & Sons)	Municipal Fruit Markets.
Wilson, Claude (Wilson and Croucher)	City Fruit Markets, Quay-street.
Wilson, Herbert	No. 25 City Fruit Markets, Sydney.
Windows, Ernest (Windows and Caro)	City Fruit Markets, Quay-street.
Wing Sang & Co., Ltd.	58 Hay-street.
Wong, Thomas (Mow Sang & Co.)	Ultimo-road, Sydney.
Woodcock, John (A. E. Spurway)	Fruit Exchange, Bathurst-street.
Woodcock, Walter (A. E. Spurway)	Fruit Exchange, Bathurst-street.
Woolland, Walter	City Fruit Markets, Quay-street.
Yeoman, Eric Thelwell	City Municipal Markets.
Yocksui, Gee William (Yocksui Bros.)	4 Ultimo-road, Sydney.
Young, Francis William (N.S.W. Produce Co.) ...	235 Sussex-street, Sydney.
Young, Leong (Hop Lee & Co.)	9 Municipal Buildings, Ultimo-rd.
Young, William Gock (Wing On & Co.)	Ultimo-road and Quay-street,

Poultry Notes.

MARCH.

E. HADLINGTON, Poultry Expert.

A SCARCITY of pollard and bran, and the possibility of the position becoming accentuated, have brought a request from the Miranda Co-operative Society for information as to the extent to which certain substitutes can be used to take the place of pollard and bran.

From time to time the matter of food substitutes has been dealt with in these "Notes," and suggestions offered regarding the use of various meals which could be included in conjunction with pollard and bran. One of the chief difficulties, however, in finding substitutes is the fact that the conditions which create a shortage of pollard and bran also affect the supply and price of the other commodities. Therefore, while various formulae are given below, the use of any particular substitute must be governed by considerations of cost and regular availability.

It has been previously pointed out that when prices of other commodities which can be used for poultry feed are comparable with pollard and bran, a more general use of such would tend to ease the position with regard to pollard and bran, of which there is a frequently recurring shortage. It may be argued that there are not many substitutes available when required by poultry-farmers, but while this is generally quite true, the fact must not be lost sight of that if there was a steady demand for the various commodities, such as wheat meal, crushed oats, maize meal, &c., the requirements would be met.

In this direction a strong poultry-farmers' organisation compassing the State could, by propaganda amongst its members, do a great deal towards placing poultry-farmers in a more independent position regarding the supply of pollard and bran.

Substitutes for Use in the Morning Mash.

With a view to using any one or more of the different meals according to the economic position, various components are given hereunder which, used in conjunction with the evening meal of grain, will form a balanced ration:—

		lb.
(1)	*Pollard	60
	Bran	20
	Lucerne Meal or Chaff	15
	M.I.B. Meat Meal, 5 to 7 lb.	5
		100

		lb.
(2)	Pollard	35
	Bran	10
	Wheat Meal	33
	Lucerne Chaff, Meal, or Dust	15
	Meat Meal	7
		100

* No. 1 formula is the standard recommended by the Department and fed at Hawkesbury Agricultural College and other Government farms.

Substitutes for use in the morning mash—*continued.*

(3)	lb.
Pollard	30
Bran	10
Wheat Meal	30
Maize Meal	10
Lucerne Chaff, Meal, or Dust	11
Meat Meal	5
Butter-milk or Milk Powder	4
	100

(4)	lb.
Pollard	25
Bran	17
Oaten Pollard	30
Lucerne Meal, Chaff, or Dust	20
Meat Meal	5
Milk Powder or Butter-milk	3
	100

(5)	lb.
Pollard	20
Bran	15
Wheat Meal	15
Oaten Pollard	20
Maize Meal	10
Lucerne Chaff, Meal, or Dust	10
Meat Meal	5
Butter-milk or Milk Powder	5
	100

(6)	lb.
Pollard	30
Bran	10
Wheat Meal	15
Oaten Pollard	15
Lucerne Meal, Chaff, or Dust	10
Coconut Oil Cake	10
Linseed Meal	5
Meat Meal	5
	100

In connection with the use of milk products, the question is often raised whether such could be used as a substitute for meat or meat meals to balance the ration for adult stock, but while milk and milk concentrates are a very valuable adjunct to a ration, being rich in calcium and phosphorus, it has been established that the proteins of meat, &c., are on the whole of greater value for supplementing the deficiencies of cereals, &c.. than those of milk, and milk is also deficient in iron.

The question of cost and quantity available has also to be considered with regard to milk products.

Substitutes in the Evening Feed.

With regard to the evening feed, the use of a larger proportion of maize while it is so much cheaper than wheat would help to reduce the cost of feeding. The results of maize and wheat feeding as published in last month's notes should reassure those who have previously been in doubt as to the advisability of using a greater percentage of maize. Yellow maize is better than white, as it contains more of the fat soluble A. vitamine than the latter, and also imparts a deeper colour to the yolks of the eggs.

Oats and barley could be used to supplement the usual evening feed when cheap enough, but in comparing the price of these cereals with wheat and maize it has to be remembered that oats only weigh 40 lb. to the bushel and barley 50 lb.

Owing to the amount of fibre in barley, it is not advisable to use more than 20 per cent. in conjunction with wheat and maize. The same applies to sorghum or millet seed, which if available could be used to a limited extent.

Avoid Sudden Changes.

In making any changes in the usual diet of the birds there should be no sudden alteration, particularly at this time of the year, because by doing so a moult may result; in fact, at any time there is a risk of putting the birds off laying. Therefore, any substitution should be made gradually by using at first only a small percentage of the new item, and increasing every few days so that the change is spread over about a month at least.

The Importance of Good Shell Grit.

While dealing with the subject of feeding poultry, the importance of good shell grit, and its bearing upon egg production and the quality of shells of the eggs, might be touched upon. Unfortunately, satisfactory grit is not always available, and in some cases there appears to be a lack of knowledge as to what constitutes suitable grit, and one frequently sees the receptacles in the pens filled with grit which the birds do not eat, or from which, at any rate, they do not obtain sufficient for their requirements. In this regard, fine material and very large shells are equally bad, and there are the blue shells which it will be found are always rejected by the birds. Another class of grit which is not satisfactory is that containing mostly water-worn shells.

The ideal grit is that which is sharp, even in size, not larger on the average than ordinary cracked maize, and somewhat soft, rather than very hard. One of the main functions of shell grit is to supply shell-forming material, and therefore that containing the greatest percentage of carbonate of lime is the best. The fairly soft class of shells is the most satisfactory as the carbonate of lime is more readily assimilated. This is why oyster shell is often introduced, and but for the cost would be more universally used.

Where fine grit is used, care is necessary to replenish the supply in the pens as soon as the larger material is eaten; otherwise the small shell gets settled down into a solid mass, and the birds are not able to obtain as much as they require. This results in a lowered egg yield, and frequently in thin-shelled eggs. It is important also that the grit vessels should not be allowed to become completely empty, as is often observed on farms, because where this happens the birds have probably been short of their requirements for some days, which would have the same result as mentioned above.

Another matter which might be referred to while dealing with this subject, is the practice of using shell grit in the nests and making this the only source of supply for the hens. Where this is done it will be found that after the grit has been in the nests for a short time, the birds refuse to eat much of it on account of it becoming dirty. A separate supply of grit should always be provided.

THE loss of fertility due to bad cultivation is very often not fully realised, and many crop failures are probably due more to lack of proper soil preparation and subsequent cultivation than to a deficiency of plant foods.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.	Society and Secretary.		Date.
Gundagai (P. J. Sullivan)	Mar.	13, 14	Coonabarabran (C. D. Cox)	Mar.	27, 28
Macksville (G. Hughes)	,,	13, 14	Molong (W. P. Stanger)	,,	27, 28
Crookwell (P. R. Marks)	,,	13, 14, 15	Muswellbrook (R. C. Sawkins)	,,	27, 28, 29
Armidale (A. McArthur)	,,	13 to 16	Cathcart (B. A. Stewart)	,,	28
Bombala	,,	14, 15	Sydney Royal (G. C. Somerville)	April	2 to 11
Wauchope (T. Suters)	,,	15, 16	Narrabri (W. A McDonald)	,,	18, 19
Adaminaby (P. L. Crisp)	,,	15, 16	Gloucester (M. Newton)	,,	18, 19
Mudgee (O. Watkins)	,,	15, 16, 17	Wee Waa (D. B. Martyn)	,,	24, 25
Campbelltown	,,	16, 17	Grafton (L. C. Lawson)	,,	25 to 28
Bowral Horse Show (E. Waine)	,,	16, 17	Wingham (D. Stewart)	,,	26, 27
Penrose	,,	17	Forster (W. Poppenhagen)	,,	27, 28
Merriwa (V. Budden)	,,	20, 21	Casino (P W. Swanson)	May	1, 2, 3
Orange (G. L. Williams)	,,	20, 21, 22	Maclean (T. B Notley)	,,	2, 3
Tamworth (E. E. Upjohn)	,,	20, 21, 22	Dungog (W. H. Green)	,,	2, 3, 4
Dunedoo (O. Milling)	,,	21	Kyogle (D Campbell)	,,	9, 10
Stroud	,,	21, 22	Gresford (A. R. Brown)	,,	11, 12
Quirindi (G Curtis)	,,	21, 22, 23	Trangie (F. H. Hayles)	,,	15, 16
Kempsey (N. W Cameron)	,,	21 to 23	Narandera Sheep Show	July	18
Goulburn (T Higgins)	,,	22, 23, 24	Wagga Wagga (F H. Croaker)	Aug.	21,
Camden (G V. Sidman)	,,	22, 23, 24	Junee (G W. Scrivener)	,,	28, 29
Mendooran (T. R. Mason)	,,	23	Ganmain (C. C. Henderson)	Sept.	11, 12
Blayney (J H Moore)	,,	27, 28	Melbourne Royal	,,	20 to 29
Batlow (C S. Gregory)	,,	27, 28	Narandera (J. D. Newth)	Oct	9, 10

THE AMERICAN CO-OPERATIVE ORGANISATIONS GREW SLOWLY.

CO-OPERATION in California has about fifty-five years of history back of it. In the field of fruit-marketing in particular, the first important organisation was the California Fruit Union formed in 1885 and operated until 1893. Organisation effort in the citrus and raisin industries dates back to about the same period. The old Associated Raisin Company, organised in 1912, was the culmination of twenty years of almost continuous organisation and failure. And the California Fruit Growers' Exchange, organised on something like its present plan in 1905, was the result of at least fifteen years of stumbling effort. A little study of specific organisation quickly shows that the present organisations are the result of nearly two generations of struggle.—H. E. ERDMAN, in *Co-operative Marketing Journal.*

WAR ON LIVESTOCK PARASITES IN U.S A.

PARASITES injure livestock on the farms and ranches of the United States probably to the extent of hundreds of millions of dollars annually. This is the conclusion reached by Dr. John R. Mohler, Chief of the Bureau of Animal Industry, United States Department of Agriculture, after reviewing the evidence collected by his bureau. "The inroads of parasites, especially the internal kinds," he says, "constitute a livestock problem of great importance. Losses from parasites have been tolerated too long and accepted too complacently. The livestock industry cannot afford to let this situation continue, especially when certain parasites are exacting more and more tribute—more and more blood money."

Orchard Notes.

MARCH.

C. G. SAVAGE and W. LE GAY BRERETON.

THE present is the busy period for apple and pear growers, and also for the producer of sultanas, raisins, and prunes.

In last month's Notes, the picking and packing of apples and pears was fully dealt with, and though the remarks were specially framed as a guide to exporters they apply equally as well to the preparation of the fruit for domestic markets. This is particularly the case in the present season, when not only is the production of apples in this State greater than it has ever been before, but very heavy crops are also being harvested in Victoria and Tasmania, so that with heavy supplies coming forward buyers will be fastidious.

The drying of sultanas, raisins, and prunes is dealt with in a free leaflet procurable from the Under Secretary, Department of Agriculture, Sydney, and also in Farmers' Bulletin No. 52, "Fruit Drying"; price, 10d., post free.

In Citrus Orchards.

The present is not the busiest time for the citrus grower, and it is therefore opportune to carry out soiling operations, providing the orchard land is not too wet to stand the necessary carting.

It is also a good time for planting out young citrus trees if the soil is in a suitable condition. In districts at all liable to frosts, provision should be made to shelter young citrus trees by bushes or other means a short time before the frosts approach.

Cover Crops.

As pointed out in previous Notes, leguminous crops for ploughing under should be sown in February if weather conditions are suitable, but if for any reason this has not been done a crop can be sown early this month. It is well to mention once more that when such crops are grown in irrigated orchards more water must be supplied as increased moisture is required to support both trees and green crop. Where irrigation water is not available, it is only safe to grow green crops in the orchard in those regions where the rainfall is ample for both trees and crop.

Should a dry spell set in after a green manure crop has been sown amongst citrus trees in an area where irrigation is not possible, and it becomes apparent that the trees are suffering from the competition for soil moisture, the green crop should be sacrificed and be ploughed in at once, even though it is not nearly full grown, otherwise the next crop of

fruit will be jeopardised. In any class of orchard the ploughing under of the green crop should be completed by the first half of July, to give it time to rot before the spring and to allow the land to absorb any rain that may fall.

Pests and Diseases.

Citrus Scale.—It is still a good time to carry out fumigation for red scale, even though in some cases the young scale may have developed its covering too much to be easily killed by sprays.

Codling Moth.—Apple and pear growers are liable to forget this enemy during the rush of work connected with getting their crops to market or store, but if the pest is neglected now, although the effects will not be much felt this season, a great deal more harm will certainly be caused next year. The bandages should be regularly examined and all infected fruit promptly destroyed by boiling. All second-hand or returned cases should be dipped completely under boiling water for not less than three minutes. It is surely madness to spend money on the control of codling moth on the one hand and to introduce fresh moths from elsewhere in old untreated cases.

Ripe or Bitter Rot.—In many places the weather conditions have been favourable for the development of fungous diseases, and it is quite likely that ripe or bitter rot will occur in late hanging apples. It would, therefore, be advisable to spray with 6-4-50 Bordeaux mixture. Fortunately, this spray mixture does not russet the apple to any appreciable extent when applied late in the season.

Preparation of Land for Planting.

In view of heavy supplies of fruit and low prices, it is probable that very few growers are contemplating extension of their areas, and the warning issued by this Department in the Better Farming Train, *i.e.*, "Do not increase fruit areas faster than the markets can expand," should certainly be considered before one decides to extend. If, however, planting has been decided upon it is a good practice in dry areas to plough and subsoil the land some months previous to the planting season. By doing this the land is enabled to absorb any rain that falls, and one can be almost certain of having it in moist enough condition at the best time for planting.

Infectious Diseases Reported in January.

The following outbreaks of the more important infectious diseases were reported during the month of January, 1928:—

Anthrax	3
Pleuro-pneumonia contagiosa	12
Piroplasmosis (tick fever)	Nil.
Blackleg	3
Swine fever	Nil.

—Max Henry, Chief Veterinary Surgeon.

CONTENTS.

Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WHEAT, OATS, AND BARLEY EXPERIMENTS, 1927.

CENTRAL WESTERN DISTRICT.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

THE wheat-growers who co-operated with the Department of Agriculture in conducting wheat and oat experiments in this district during the season 1927–28 numbered forty-one.

Despite the adverse nature of the season only two of this number had crops which were too poor to harvest satisfactorily, while, on the other hand, yields of 30 bushels per acre and over (up to 41 bushels in one case) were obtained at a number of centres.

The experiments were distributed over a wide area, and were located with the following farmers :—

Wheat Variety Trials—

C. A. Carter, "Kikiamah," Grenfell.
H. Nealon, "Currajong," Quandong, via Grenfell.
H. H. Taylor, Ravensleigh, Eualdrie, via Grenfell.
Maroney Bros., "Miramichi," Tyagong, via Young.
Powderley Bros., "Cambrai," Tyagong, via Grenfell.
V. E. Duffy, Bogalong, via Grenfell.
C. J. Trent, Forbes-road, Grenfell.
R. B. Black, "Braemar," Greenethorpe.
J. A. O'Brien, "Clairmont," Greenethorpe.
E. Reid, "Myonah," Brundah.
F. Mulligan, "Woodlands," Trajere, Eugowra.
C. Pengilly, "Springthorpe," Eugowra.
F. L. B. Corke, Wynnefield, via Cowra.
A. C. Nash, Burdett, via Canowindra.
R. A. H. Balcombe, "Sussex," Toogong, via Cudal.
Chas. Davis, "Larnacoorie," Cargo.
W. J. Bradford, "Pine Park," Eulimore.
Robinson Bros., Tallawang, via Gulgong.
D. O'Neil, "Clear View," Bowan Park.
G. L. McLaren, "Locksley," Nora Creek, via Molong.

Oat Variety Trials—

S. Nash, "Wollombeen," Lockwood, via Canowindra.
Wm. Burns, "Goongawarrie," Carcoar.
H. Nealon, "Currajong," Quandong, Grenfell.
G. L. McLaren, "Locksley," Nora Creek, via Molong.
H. C. Toole, "Helston," Tarana.
C. A. Carter, "Kikiamah," Grenfell.
J. T. Cantrill, "Hazeldoon," Borenore.

Manurial Experiments on Pure Seed Areas—

H. V. Gray, "Martindale," Greenethorpe.
F. Adams, "Renown," Greenethorpe.
J. T. Hawick, Quandong, Grenfell.
A. McKay, Greenethorpe.
Barr Bros., "Kelvin Grove," Tyagong.
N. G. McMillan, "Marrar," Eugowra.
C. L. Baker, "Harlestone," Tyagong.
H. Pengilly, "Springthorpe," Eugowra.

Manurial Experiments on Pure Seed Areas—continued.
O. G. Blayney, "Baroola," Grenfell.
S. Nash, "Wollombeen," Canowindra.
Robinson Bros., Tallawang, Gulgong.
D. O'Neill, "Clear View," Bowan Park.
G. L. McLaren, "Locksley," Nora Creek, via Molong.

Other Pure Seed Areas—
R. H. Herbert, "Glenwood," Eugowra.
P. Hayes, Iandra, via Greenethorpe.
W. Ryan, Trajere, Eugowra.
F. Hughes, Erudgere, via Mudgee.
A. Simpson, "Girrahween," Grenfell.
R. Pfeiffer, Mogongong, via Grenfell.
B. J. H. Munns, McDonald Creek, via Mudgee.
W. J. Bradford, "Pine Park," Eulimore.
N. G. McMillan, "Marrar," Eugowra.

Gypsum Manurial Trial—
W. F. Griffin, "Valicare," Mogongong, via Grenfell.

With the exception of two, all the above experimenters were members of one of the following branches of the Agricultural Bureau:—Cranbury, Quandong, Kikiamah, Eugowra, Bogalong, Eualdrie, Tyagong, Greenethorpe, Birriwa, Bowan Park, Tarana, Borenore, and Erudgere.

The Season.

The winter of 1926 was exceptionally wet, and was followed by a very dry spring and early summer. This made conditions for commencing the fallow for 1927 sowing difficult, and the initial ploughing was not done under ideal conditions. The first heavy rain occurred in January, 1927, and provided an opportunity of putting the fallow in good condition. From January on the weather conditions were exceptionally dry, right through the sowing period to the end of September. Only on well-cared-for fallow was there sufficient moisture to germinate seed satisfactorily when aided by light falls in May and June. Germination on stubble land and poor fallows was not satisfactory, and growth was slow and thin. Exceptionally heavy and numerous frosts seriously affected both wheat and oats, and were responsible for low yields in many localities. From mid-September the temperatures began to rise, and the ground being by this time almost dry, it appeared as if crop failures would be numerous. At the end of the month, however, excellent rains fell, and continued at intervals of about a fortnight till harvest. The effect of this change of conditions was remarkable, and the yields of wheat obtained were positive evidence of the vitality of the wheat plant. Oats made a wonderful recovery also, but hardly to the same extent as wheat. During the harvest more rain fell, which was unfortunate, as it bleached the grain considerably, and greatly reduced its weight. The sample of grain was, however, very good, being quite plump, except in the earlier portions of the district, where it was pinched.

Flag smut was the most prevalent disease, owing largely to the dry sowing period. Other diseases were very mild in their attack. The yields in most localities were also reduced by shelling out, several very bad days—hot with a strong wind—being experienced during harvest.

The wheat-growers' lot for the 1927 season was, therefore, not a happy one. Briefly, he had to contend with a dry fallow period, a dry sowing period, a dry winter and spring, flag smut, considerable frost damage, loss through wind damage, and loss in weight through harvest rains. As an offset, he secured good rains from the end of September till the crops matured, and very fair yields were obtained where crop failures were imminent.

The following table shows the distribution of rainfall at representative centres:—

RAINFALL at Representative Centres.

	Grenfell.	Eugowra.	Greenethorpe.	Tallawang.	Cranbury.	Cowra.	Tyagong.	Carcoar.	Erudgere.	Nora Creek.
					During Fallow Period.					
1926.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
August	177	134	155	127	174	185	167	201	107	114
September ...	157	156	165	382	184	194	160	236	372	126
October ...	82	68	170	95	62	180	102	160	85	165
November ...	20	6	70	10	5	51	21	29	20	5
December ...	286	224	130	677	220	347	220	350	125	210
1927.										
January ...	364	265	524	200	244	380	380	264	368	231
February ...	15	22	Nil.	Nil.	Nil.	5	12	14	Nil.	Nil.
March	44	147	45	Nil.	90	152	42	120	25	Nil.
Total on fallow	1,145	1,022	1,259	1,491	979	1,494	1,104	1,474	1,102	851
					During Growing Period.					
1927.										
April	55	71	56	284	73	88	74	75	193	71
May	71	21	93	85	75	98	81	148	85	60
June	97	109	72	87	62	76	102	65	83	78
July	94	47	134	73	62	78	116	225	72	85
August	105	106	114	61	94	109	81	175	62	66
September ...	124	174	167	129	175	240	186	364	136	301
October ...	195	168	289	91	242	263	211	213	81	87
Nov. (to 15th)...	228	146	223	113	126	269	238	194	129	126
Total on crop	969	842	1,148	923	909	1,221	1,089	1,359	841	874

Cultural Details for Wheat Variety Trials.

Grenfell (C. A. Carter).—Medium red basaltic loam, average depth about 6 inches, clay subsoil, old cultivation paddock; mouldboard ploughed 4 inches early September, springtoothed October, harrowed November, springtoothed January, March, and prior to drilling, all workings from October being shallow depth; drill sown 16th-17th May with seed, 60 lb., and superphosphate, 60 lb. All varieties showed a little shelling out, Boolaroo being worst in this respect.

Quandong (H. Nealon).—Light red loam, level site, granite formation; very old cultivation paddock, clay subsoil at 5 inches; mouldboard ploughed 4 inches September, springtoothed six times, twice before December and four times afterwards, last one just prior to sowing; harrowed May; hoe drill

sown and harrowed; seed at 60 lb. and superphosphate at 75 lb. per acre. All varieties except Nabawa and Riverina shelled a little; Boonoo very badly.

Eualdrie (H. H. Taylor).—Light red loam, 6 inches deep, originally pine and box country; old cultivation paddock; mouldboard ploughed end of August, springtoothed December, disced March, harrowed April, springtoothed April, May, and in June prior to hoe drilling; all tractor work; sown 7th June, seed at 70 lb. and superphosphate at 100 lb. per acre.

Wynnefield (F. L. B. Corke).—Medium red loam, cropped since 1910, clay subsoil at 6 inches; mouldboard ploughed August, harrowed twice in December, disced end of January, springtoothed March, disced end of March and again early May, harrowed in front of hoe drill; sown 16th-17th May with 60 lb. seed and 78 lb. superphosphate. Medium infection of flag smut in all plots except Riverina.

Greenethorpe (R. B. Black).—Light red sandy loam, undulating, clay subsoil at about 5 inches, old cultivation ground; mouldboard ploughed April and reploughed September, harrowed December, springtoothed January, harrowed January, February, and April, springtoothed end April, combine sown and harrowed 17th-18th May; seed at 58 lb. and superphosphate at 80 lb.

Tallawang (Robinson Bros.).—Light medium red loam with clay subsoil at 5 to 6 inches; site of experiments cropped for fifty years; since 1916 has been under definite rotation of (1) winter fodder crop, and (2) wheat; the fodder crop (oats and barley) sown in March and fed off May to end of September; ploughing for wheat not later than end of October; average yield for past eight years has been nearly 25 bushels per acre. It has of late years been the outstanding paddock of wheat in the district for yield, cleanliness, and freedom from disease, and the rotation is worthy of much wider adoption. For the 1927 crop the ground was disc ploughed mid-September, springtoothed February and in April just prior to sowing with hoe drill; sown 18th May with seed at 58 lb. and superphosphate at 56 lb. The rainfall on the fallow was 12·44 inches, and on the crop 6·39 inches; the season was a very severe one in this locality, only 4·41 inches of rain being recorded from sowing to end of October.

Eugowra (F. Mulligan).—Light red granitic loam, level, under cultivation many years; mouldboard ploughed 6 inches July, harrowed twice, springtoothed twice in September, combined twice in January and several times between then and sowing; combine sown 7th May and harrowed; seed at 60 lb. and superphosphate at 80 lb.; sowing too early for Riverina.

Toogong (R. A. H. Balcombe).—Light red loam, undulating, cropped for fifteen years with wheat and oats; mouldboard ploughed end of August, harrowed September, springtoothed January, disced February, combined March and harrowed; combine sown and harrowed 25th May with 70 lb. seed and 56 lb. superphosphate.

Greenethorpe (J. A. O'Brien).—Level red basaltic, medium loam, about 5 inches to clay subsoil, old cultivation; stubble not burnt; mouldboard ploughed 4 inches July-August, scarified full depth early October, and harrowed twice after, scarified mid-January and early March and harrowed, scarified and harrowed May; combine sown and harrowed 3rd June with 52 to 56 lb. seed and 69 lb. superphosphate; conditions prevented earlier sowing. Sowing was too late for all varieties except Binya; germination was a little patchy, and severe frosts affected yields.

Tyagong (Powderley Bros.).—Medium sandy loam, about six crops grown previously; mouldboard ploughed 5 inches in August, springtoothed October, February, twice in March, April, and May, harrowed before hoe drill sowing.

Cranbury (C. Davis).—Strong red clay loam, pine and box country, clay subsoil at 6 inches, old cultivation, sloping; disc ploughed July-August, harrowed end of September, disced October, springtoothed February and before sowing with hoe drill on 24th-25th May with 56 lb. seed and 50 lb. superphosphate. Sown in dry seed-bed, but rain followed immediately; very severe winter conditions and lack of moisture adversely affected stooling and growth. Bena burnt off in the heavy soil in September, and Canimbla to a less extent.

Eugowra (C. Pengilly).—Light red sandy loam, seven previous crops, last one oats; mouldboard ploughed August, scarified October, harrowed December, scarified January, harrowed March; combine sown and harrowed 26th May with seed at 60 lb. and superphosphate at 70 lb.

Eulimore (W. J. Bradford).—Red basaltic loam, pine and box country, clay subsoil at 5 inches, cropped three times previously; mouldboard ploughed September, disced October, springtoothed January, harrowed February, combined March; combine sown 14th May and harrowed, seed at 60 lb. and superphosphate at 60 lb. Rainfall, April to November, 8·64 inches; rain came too late for Waratah and Hard Federation.

Tyagong (Maroney Bros.).—Strong red basaltic loam, clay subsoil at 4 to 6 inches; cropped since 1920, grazing year prior to fallow; mouldboard ploughed 5 inches in September, springtoothed October, harrowed and disced January, springtoothed May; hoe drill sown 16th May with seed at 60 lb. and superphosphate at 71 lb. Crop burnt off in September; grain was slightly pinched; Duchess and Gallipoli were small plots sown on long lands, and gained a slight advantage over the other plots.

Nora Creek (G. L. McLaren).—Light red sandy loam, clay subsoil at 6 inches; old cultivation; mouldboard ploughed September, springtoothed October, harrowed January; combine sown 24th May and harrowed, seed and superphosphate at 56 lb. per acre. Season particularly dry in this locality, and winter frosts severe and continuous.

Bogalong (V. E. Duffy).—Light red loam, cropped with wheat once previously; mouldboard ploughed September, springtoothed January, February, and March, harrowed March, springtoothed April and May; disc drill sown 9th June with 60 lb. seed and superphosphate.

Yields of Wheat Variety Trials.

Variety.	Quandong (H. Nealon).	Grenfell (C. A. Carter).	Greenethorpe (R. B. Black).	Tallawang (Robinson Bros.).	Trajere (F. Mulligan).	Nora Creek (G. L. McLaren).	Wynnefield (F. L. Corke).	Toogong (R. A. H. Balcombe).	Tyagong (Powderley Bros.).	Eugowra (C. Pengilly).	Cargo (C. Davis).	Tyagong (Maroney Bros.).	Eulimore (W. J. Bradford).	Greenethorpe (J. A. O'Brien).	Eualdrie (H. H. Taylor).	Bowan Park (D. O'Neill).	Burdett (A. C. Nash).	Bogalong (V. E. Duffy).	Bogalong (C. J. Trent).	Brundah (E. Reid).
	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.
Waratah	25 9	22 30	...	20 43	...	15 23	23 49	32 23	28 15	21 26	...	18 25	26 55	...	20 10	22 34	25 35	32 59	...	26 30
Bena	22 54	20 32	...	...	15 27	16 9	23 21	29 42	...	...	21 44	18 50	...	23 21	22 1	18 10	20 5	...	17 3	...
Duchess	...	25 7	...	...	17 16	...	...	...	...	...	...	23 6	...	23 2	...	...	...	...	...	...
Nabawa	21 28	22 31	...	...	...	...	...	...	...	21 48	...	...	...	...	...	...	...	...	...	30 2
Exquisite	...	23 25	...	...	21 40	...	...	...	...	...	...	...	...	21 42	24 42	...	...	...	...	...
Nizam	...	20 50	...	...	...	...	...	...	26 12	15 8	...	...	...	...	23 5	...	...	...	...	...
Yandilla King ...	...	...	30 44	...	17 26	15 27	...	...	...	...	...	...	30 36	25 15	...	...	20 30	...	23 15	...
Marshall's No. 3 ...	...	24 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Turvey	...	...	26 23	...	19 58	...	23 15	...	...	...	23 8	...	28 19	...	22 56	...	...	...	...	...
Rajah	...	22 42	30 54	18 55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ghurka	...	15 20	...	13 5	...	...	...	29 22	...	...	...	...	...	...	...	16 50	...	20 48	...	...
Boolaroo	...	16 20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Union	...	...	...	...	17 3	14 12	...	41 40	...	...	...	...	...	...	...	...	...	...	17 50	...
College Purple Straw	22 55	...	...	22 48	...	15 1	...	...	...	...	23 6	...	...	...	...	...	20 55	...	...	...
Riverina	17 22	...	...	18 16	13 52	...	21 1	...	27 8	...	...	...	...	...	...	...	...	...	...	...
Duri	20 10	...	...	14 12	...	...	...	31 23	...	...	...	...	...	...	19 30	...	...	26 58	...	...
Boonoo	19 44	...	21 28	...	...	...	...	...	...	15 30	...	...	...	...	...	...	...	...	13 30	28 20
Bandon	19 33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Barootta Wonder ...	17 48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ford	17 3	...	...	...	...	...	...	...	...	...	23 54	...	...	...	...	...	...	...	...	...
Penny	...	23 54	...	...	20 31	...	...	...	...	...	25 50	...	...	...	...	...	...	...	...	...
Federation	...	...	28 38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gallipoli	...	...	24 55	...	17 4	...	...	...	...	...	...	19 30	...	...	...	...	...	...	...	...
Canberra	...	...	...	15 9	...	14 20	...	28 42	...	13 19	...	...	...	...	...	...	...	23 38	...	...
Wandilla	...	...	...	...	...	12 49	...	...	...	...	25 27	18 17	...	...	...	20 30	22 40	...	23 6	...
Clarendon	...	...	...	...	...	12 19	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gresley	...	...	...	...	...	11 37	...	24 6	18 30	11 56	...	...	...	...	...	...	...	26 0	...	22 15
Ranee	...	...	...	...	...	...	23 47	...	...	...	...	...	...	...	...	...	...	21 12	14 37	...
Cadia	...	...	...	...	...	...	22 58	...	...	...	...	...	...	...	...	18 43	...	...	...	...
Robin	...	...	...	...	...	...	...	...	30 10	...	...	...	...	...	23 8	...	...	...	...	...
Canimbla	...	...	...	...	...	...	...	...	...	...	23 5	...	...	...	...	20 48	...	...	...	...
Hard Federation ...	...	...	...	...	...	...	...	...	...	...	...	...	24 14	...	...	...	...	...	...	...
Binya	...	...	...	...	...	...	...	...	...	...	...	...	...	22 3	...	...	...	24 33	...	28 20
Pusa No. 4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12 0	...

Burdett (A. C. Nash).—Light red sandy loam, undulating, under cultivation twenty years; mouldboard ploughed July, springtoothed January, February, end April, combined prior to drilling; sown 5th-6th May with 56 lb. seed and 50 lb. superphosphate. Germination not good in Bena.

Brundah (E. Reid).—Medium red loam, pine and box country, clay subsoil at 5 inches; old cultivation paddock; mouldboard ploughed September, harrowed October, combined November and three times from January to sowing: combine sown 28th May and harrowed, seed at 60 lb. and superphosphate at 90 lb.

Bowan Park (D. O'Neil).—Very strong, deep, red basaltic loam, clay subsoil at 6 inches; site cleared fifty years ago and cropped with wheat, oats, and maize at irregular intervals; fallowed but not sown 1925–26; mouldboard ploughed September 1926, springtoothed end October, disced January, springtoothed March and prior to sowing with hoe drill on 20th-21st May, 60 lb. seed and 50 lb. superphosphate; sown in dry seed-bed, but rain fell immediately after. Frosts particularly severe; burnt off a little in September.

Bogalong (C. J. Trent).—Light to medium red loam, three previous crops; fallowed for 1926 season, but too wet to sow; mouldboard ploughed August, disced November, springtoothed December, January, and prior to hoe drilling on 21st May; seed and superphosphate at 60 lb. Some shelling as the result of heavy wind before harvesting, Boonoo being badly affected. The late-maturing wheats benefited from late falls of rain, and gave much higher yields.

Cultural Details of Oat Variety Trials.

Lockwood (S. Nash).—Light red loam, pine and box country, cleared sixteen years ago; mouldboard ploughed September, harrowed October, springtoothed end December, harrowed January, springtoothed early March, scarified early and late May; combine sown 1st June, 50 lb. seed and 60 lb. superphosphate.

Grenfell (C. A. Carter).—Sown alongside wheat variety trial, same cultural methods; sown 17th May with 50 lb. seed and 60 lb. superphosphate. Wind damage caused reduction of yields, particularly Mulga.

Nora Creek (G. L. McLaren).—Same details as wheat variety trial; sown 25th May with 50 lb. seed and 56 lb. superphosphate; season very severe, and oats only grew from September rains; thin and stooled poorly; Mulga proved most hardy variety.

Quandong (H. Nealon).—Light red to grey loam, gravelly clay subsoil at 5 inches, old cultivation; mouldboard ploughed July, springtoothed six times between ploughing and sowing, and harrowed prior to and after hoe drilling on 5th May; seed at 50 lb. and superphosphate at 75 lb. per acre.

Carcoar (W. Burns).—Grey granitic loam, very old cultivation, clay subsoil at 4 to 5 inches; mouldboard ploughed February, springtoothed early April, harrowed April; sown 6th April with 1½ bushels seed and 60 lb. superphosphate; cut for hay end of November; sown for winter fodder, but the growth was short; after the late spring rains it was allowed to grow for hay.

Tarana (H. C. Toole).—Light sandy loam, granitic derivation, old paddock; mouldboard ploughed February, springtoothed early March, twice harrowed in April, sown 16th May with 1 bushel of seed and 90 lb. superphosphate. Provided several weeks of good feed in early spring, and on the advent of good growing weather stooled well, and gave very satisfactory hay yields.

Borenore (J. T. Cantrill).—Red-grey loam, granitic formation, old paddock; mouldboard ploughed end October, springtoothed November, harrowed January and February, skim ploughed, harrowed, rolled and sown with hoe drill 8th April; harrowed after sowing; seed at 1½ bushels with 90 lb. superphosphate.

YIELDS of Oat Variety Trials.

Variety.	Grain Yields.				Hay Yields.		
	Lockwood (S. Nash)	Grenfell (C. Carter).	Quandong (H. Nealon).	Nora Creek (G. L. McLaren)	Carcoar (W. M. Burns).	Tarana (H. C. Toole).	Borenore (J. T. Cantrill).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Mulga ...	28 24	29 30	29 30	18 30	1 1 1 7	0 18 2 0	......
Belar ...	29 0	29 26	33 18	...	......	0 19 1 14	......
Buddah ...	26 10	33 10	...	...	......	......	......
Lachlan ...	25 12	...	26 38	12 21	1 0 1 4	1 0 3 10	2 7 0 12
Gidgee ...	...	32 20	34 30	...	......	......	......
Myall ...	...	...	...	13 32	......	......	......
Algerian ...	...	...	...	...	1 2 0 6	1 1 3 0	2 10 3 26
Guyra ...	...	...	...	...	1 1 2 22	0 17 3 7	2 17 3 27
Sunrise ...	...	...	...	...	0 18 2 5	......	......
Kelsall's ...	...	...	...	...	......	0 17 1 14	2 5 2 21

Wheat Manurial Trials.

The cultural details of the manurial trials with wheat were as follows:—

Greenethorpe (H. V. Gray).—Light red to grey loam, old cultivation; mouldboard ploughed October, combined early February and mid-March; combine sown and harrowed 19th May, seed 65 lb.; variety, Union.

Grenfell (O. G. Blayney).—Light red sandy loam, uniform; disced April, mouldboard ploughed 4½ inches September, scarified January, combined February; combine sown and harrowed 12th May, seed 55 lb.; variety, Union.

Lockwood (S. Nash).—Light red loam, uniform; site cleared 1911, previous crop wheat; mouldboard ploughed August, harrowed October, springtoothed end December, harrowed January, combined first week in March and in May; combine sown 23rd May, seed at 68 lb.; Waratah variety.

Tyagong (Barr Bros.).—Light red loam, level and uniform, under cultivation twenty years; mouldboard ploughed July, springtoothed end September, February, and March, hoe drill sown 14th May and harrowed, seed 1 bushel per acre. Federation used and flag smut was present throughout.

Yields of Wheat Manurial Trials.

Fertiliser per acre.	Eugowra (N. G. McMillan)	Eugowra (H. Pengilly).	Greenethorpe (H. V. Gray).	Quandong (J. T. Hawick).	Grenfell (O. G. Blayney).	Lockwood (S. Nash).	Greenethorpe (F. Adams).		Tyagong (Barr Bros.).	Greenethorpe (A. McKay).	Tallawang (Robinson Bros.).	Bowan Park (D. ONeil).	Nora Creek (G. L. McLaren).	Tyagong (C. L. Baker).
	Warata.	Bena.	Union.	Bena.	Union.	Waratah.	Yandilla King.	Bena.	Federation.	Major	Canberra	Waratah.	Canberra.	Waratah.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No fertiliser ...	13 46	...	...	...	...	...	...	...	...	...	...	18 52	7 56	...
Superphosphate—														
35 lb. ...	...	...	...	...	...	...	...	...	...	...	...	22 17	...	...
40 „ ...	15 51	...	...	...	...	...	...	...	...	...	13 2	...	...	...
45 „ ...	15 49	...	...	...	...	...	...	...	...	...	...	...	...	...
50 „ ...	...	...	...	...	...	...	29 40	27 25	...	26 58	...	...	...	...
52 „ ...	...	...	31 0	...	...	...	...	...	...	...	...	...	...	...
56 „ ...	...	...	...	...	15 20	...	...	...	...	...	...	25 53	14 20	25 5
60 „ ...	16 45	16 54	...	26 40	...	31 22	...	...	18 18	...	15 9	...	...	...
65 „ ...	...	...	...	...	17 15	...	...	...	...	...	...	...	...	...
70 „ ...	17 47	...	...	...	...	...	...	...	...	28 7	...	...	...	...
75 „ ...	...	...	30 18	...	17 30	...	...	...	...	...	...	...	...	...
80 „ ...	...	19 50	...	25 13	...	32 14	35 35	33 30	21 28	...	15 8	...	...	...
84 „ ...	...	...	...	...	...	...	...	...	...	...	...	23 20	...	...
88 „ ...	...	...	32 4	...	...	...	...	...	...	...	...	...	...	...
90 „ ...	...	...	...	...	...	...	...	...	...	28 38	...	...	...	...
95 „ ...	...	...	...	...	...	...	...	...	22 7	...	...	...	...	...
100 „ ...	16 43	18 35	...	28 51	...	31 45	...	...	...	...	...	...	...	...
109 „ ...	...	...	36 0	...	...	...	...	...	...	...	...	...	...	...
120 „ ...	...	21 34	...	...	...	...	...	...	...	...	...	...	...	...
Basic superphosphate, 56 lb...	...	...	...	...	...	...	...	...	...	...	...	...	12 0	...
*M5 mixture, 56lb.	...	...	...	...	...	...	...	...	...	...	...	...	...	20 15

* M5 mixture consists of 2 parts of superphosphate to 1 of sulphate of ammonia.

Quandong (J. T. Hawick).—Light red basalt loam, old paddock, previous crop wheat; mouldboard ploughed August, harrowed October, springtoothed November, December, and twice January, twice springtoothed and harrowed between January and sowing with hoe drill on 23rd May; seed at 60 lb.; Bena was variety used, and grain shelled out a little.

Greenethorpe (A. McKay).—Grey clay loam, old cultivation; mouldboard ploughed July, springtoothed October, combined February, springtoothed May; combine sown 2nd June and harrowed when coming through. Major used.

Eugowra (N. G. McMillan).—Dark red alluvial loam, level and uniform, old cultivation; disc ploughed September, combined end October, harrowed end December, combined and harrowed end February, harrowed March; combine sown and harrowed 6th June, seed at 60 lb.; variety, Waratah.

Eugowra (H. Pengilly).—Light red sandy loam, old cultivation, previous crop oats; skeleton mouldboard ploughed end August, springtoothed end September, scarified January and March; combine sown and harrowed 12th May, seed at 60 lb.; Bena variety.

Greenethorpe (F. Adams).—Medium red loam, mouldboard ploughed June-July, springtoothed September and January, harrowed February; combine sown 24th May and harrowed, seed at 60 lb., of Bena and Yandilla King.

Bowan Park (D. O'Neil).—Same details as in wheat variety trial; sown 20th-21st May with 1 bushel of Waratah.

Nora Creek (G. L. McLaren).—Same details as wheat variety trial; sown with Canberra on 24th May at 56 lb.

Tallawang (Robinson Bros.).—Same details as wheat variety trial; sown with Canberra on 18th May at 58 lb. This trial has been in force with Canberra for some years, using no manure plot. As this invariably gave a light yield it has been discontinued and a heavier application made. This did not give an increased yield over the smaller amount this season. Rainfall from April to 15th November was 9·23 inches.

Tyagong (C. L. Baker).—Light red loam, old paddock; mouldboard ploughed August, disced February, scarified April and May; hoe drill sown 18th May, seed at 73 lb.; variety, Waratah.

Pure Seed Areas (other than Manurial Trials).

Nine of the manurial trials, details of which are given above, were pure-seed areas, the exceptions being Eugowra (H. Pengilly and N. G. McMillan), Bowan Park (D. O'Neill), Nora Creek (G. L. McLaren). In addition, eight pure-seed wheat and three pure-seed oat areas, sown in one block, were planted, but because of the dry conditions oat plots on the farms of Messrs. F. Munns

(Erudgere), and W. Ryan (Eugowra), were not harvested, while an area on the farm of Mr. R. Pfeiffer (Mogongong), was cut for hay. Cultural details of the pure seed area sown in one block are :—

Eugowra (R. H. Herbert).—Red granite loam; mouldboard ploughed July-August, springtoothed six times and harrowed twice, combine sown and harrowed, all tractor work; sown 19th May with 60 lb. seed and 70 lb. superphosphate.

Eualdrie (A. Simpson). —Light red loam, cropped for thirty years; mouldboard ploughed August, springtoothed October, January, March and May; combine sown 28th May with 60 lb. seed and superphosphate.

Iandra (P. Hayes).—Medium red loam, old cultivation; mouldboard ploughed July, springtoothed August and November, disced March, harrowed before sowing on 4th May with 56 lb. seed and 50 lb. superphosphate.

Eugowra (W. P. Ryan).—Light red loam, granite; mouldboard ploughed end August, harrowed and combined before harvest, combined end of January, March, and April; sown 6th May with 60 lb. seed and superphosphate.

Erudgere (F. Hughes).—Sandy loam, light red colour, third crop; disc ploughed July, reploughed mid-March, springtoothed prior to hoe drilling on 8th June with 60 lb. superphosphate and 50 lb. seed.

Eugowra (N. G. McMillan).—Alluvial red-black loam; disc ploughed September, combined October, harrowed December, combined and harrowed February, harrowed March; combine sown, Wandilla wheat, on 24th April with 60 lb. seed and 45 lb. superphosphate, and Buddah oats on 9th June with 40 lb. seed and 50 lb. superphosphate.

Eulimore (W. J. Bradford).—Same details as for wheat manurial trial; sown 14th May, seed at 40 lb. with 60 lb. superphosphate.

YIELDS of Pure Seed Areas (other than Manurial Trials).

Variety.	Canowindra (S. Nash).	Tyagong (C. L. Baker)	Eugowra (R. Herbert).	Green'thorpe (P. Hayes).	Eugowra (W. Ryan).	Erudgere (F. Hughes).	Grenfell (A. Simpson).	Eugowra (N. G McMillan).	Eulimore (W. J. Bradford).
Wheat—	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.	bs. lb.
Union	23 44	...	...	...	...	...	...	...	...
Waratah	...	24 5	...	14 30	...	12 0	...	...	...
Bena	...	...	14 13	...	10 20	...	...	...	...
Turvey	...	...	17 34	...	...	...	...	...	...
Wandilla	...	...	...	...	..	...	17 42	14 0	...
Oats—									
Mulga	...	...	...	...	...	...	..	...	29 26
Buddah	...	...	...	...	...	...	...	16 16	...
Belar	...	24 10	...	...	...	...	...	...	...

Gypsum Trial.

A trial of gypsum was commenced on the farm of Mr. W. F. Griffin, "Valicare," Mogongong, via Grenfell. A month before sowing, gypsum at rate of 10 cwt. per acre was applied to 1 acre of grey clay loam soil which had been mouldboard ploughed first week in July, springtoothed September, November, and January On 20th April the block was sown with Penny wheat, together with an adjoining block, both with 63 lb. superphosphate and 60 lb. seed. The yields obtained were:—

	bus	lb.
Gypsum (10 cwt. per acre)	24	12
No gypsum	20	37

The soil on number one block has become much more friable since the application of gypsum.

Seeding Trial.

A quantity-of-seed trial made in conjunction with a pure-seed area and manurial trial on the farm of Mr. O. G. Blayney, "Baroola," Grenfell, gave the following results with Union wheat, sown 12th May:—

	bus.	lb.
Seed, at 65 lb. per acre	20	30
Seed, at 55 lb. per acre	17	30

Cultivation details same as in manurial trials. Superphosphate at 75 lb. per acre in each plot.

General Observations.

Wheat Variety Trials.—The outstanding variety throughout the Central Western district this year has been Waratah, as evidenced by its success in crop competitions, and its excellent average of 24 bushels 11 lb. in fifteen widely separated localities in these experiments. This is proof of the hardiness of the variety, as the season was one of many hardships and low rainfall. The performance is all the more praiseworthy, as the variety is an early-maturing one, and normally would not have benefited to the same extent as late-maturing varieties. The varieties, other than Waratah, which gave the highest yields this season were the late-maturing varieties Turvey, Yandilla King, Penny, Wandilla, Union, College Purple Straw, and the newer varieties Exquisite and Duchess. All these varieties recovered remarkably when rain fell at the beginning of October.

Two varieties which have much to recommend them, and which performed well this season are Nabawa and Rajah—Nabawa particularly because of its resistance to flag smut, and because it did not shell out so badly as Waratah, Bena, Penny, and most other varieties, will become very popular. It headed the list at two localities, and gave an average of nearly 24 bushels at four centres. Duchess and Exquisite are good looking wheats and worthy of extended trial. Of the new departmental crossbreds—Boonoo, Boolaroo, Bobin, and Bandon—the most favoured is Bobin, which yielded over 30 bushels at one centre. Boonoo, unfortunately, shelled out very badly at all centres, and Boolaroo also at the one centre tried.

An early-maturing variety of the Canberra type which bids fair to replace that variety is Duri. The season did not suit it, but it gave an average of 22 bushels 26 lb. at five centres as against 19 bushels 2 lb. of Canberra. Riverina, which is resistant to flag smut, gave an average of 19 bus. 32 lb., the dry weather continuing too long for this early-maturing variety.

Bena was disappointing this season, except where conditions were better than the average. It undoubtedly is hard to beat under good conditions, but if the season is dry it is very short and thin, and the ear small with pinched grain.

Union and Nizam, similar wheats of the Federation type, are both good mid-season sorts with short, strong straw and compact ears, which do not shell out.

Oat Variety Trials.—The season was particularly bad for oats, which seemed to be more adversely affected by the dry conditions than the wheat, and did not make as good a recovery. In a number of instances, however, they appeared to be coming into ear 6 to 9 inches in height. When the rain came, they grew to 2 feet high with well developed ears. The harvest weather was bad for oats also, and wind did a great deal of damage in some localities.

Mulga did well this season, although it did not average as well as Belar in experiment plots. Gidgee at two centres in the Grenfell district gave an average of 33½ bushels and averaged better than all other varieties. It is an attractive oat, with plump, brown, curved grain of good length. Buddah did very well also, and further trials with it and Gidgee will prove interesting.

In hay trials the long-maturing Algerian, and to a less extent Guyra, proved the most satisfactory in the tableland portion of the district. It does not seem possible to supplant the old Algerian variety in these districts for hay.

Manurial Trials.—The information secured from the quantity of superphosphate experiments this season, particularly in view of the low rainfall recorded, is very valuable. In the twelve trials over a wide area, the results were in favour of heavy applications, ranging from 75 lb. to 120 lb. per acre. In only one instance did a quantity under 70 lb. prove the most successful. This was in a particularly strong red basalt at Bowan Park, where applying superphosphate is not general. However, 56 lb. superphosphate gave an increase of 7 bushels per acre over unmanured—a result consistent with the two previous years' experiments. That no evidence of "burning off" was present in any of the blocks receiving heavy applications of superphosphate in a dry season should definitely explode the fallacy in that regard.

The loss due to not applying superphosphate was never more apparent than this season, and increases of from 4 to 7 bushels with applications of only 56 lb. were obtained. The evidence of experiments and winning crops in wheat-growing competitions is in favour of an application of approximately 70 to 80 lb. of superphosphate per acre.

NORTHERN DISTRICT.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in conducting the trials shown alongside their names :—

G. Forge and Sons, Oxley—Wheat variety trials.
J. B. Pearson, Murroon—Wheat variety and fertiliser trials and oat variety trials.
W. J. Lye, Loomberah—Wheat variety, fertiliser and rate of seeding trials, and oat variety trials.
J. Lye, Loomberah—Wheat variety trials.
J. H. Pankhurst, Attunga—Wheat variety and rate of seeding trials, and oat variety trials.
C. and L. Luckett, Duri—Wheat variety and fertiliser trials.
I. C. Thornton, Currabubula—Wheat variety trial.
S. J. Thornton, Currabubula—Wheat fertiliser trials.
W. Bignall, Manilla—Wheat variety and fertiliser trials and oat variety trials.
J. A. Reynolds, Ben Lomond—Wheat variety and fertiliser trials, and oat and barley variety trials.
Thrift Bros., Parkville—Wheat variety and fertiliser trials and oat variety trials.
R. Winnett, Warrah Creek—Wheat variety trials.
Smith Pollock, Quirindi—Wheat, oat and barley variety trials.
G. Roworth, Warrah Creek—Wheat rate of seeding trials.
Scott Bros., Currabubula—Wheat rate of seeding trials.
A. E. Burcher, Duri—Wheat rate of seeding trial.
Titcume Bros. junior, Oxley—Oat variety trials.
V. J. Reading, Duri—Oat variety trials.
W. B. Donaldson, Currabubula—Oat variety trials.
W. Smith, Warrah Creek—Oat variety trials.

Rainfall.

The rainfall was more or less deficient from April to the end of October. The following were the registrations at a number of centres for the fallow and growing periods :—

	During fallow to 31st March. points.	During growth from 1st April. points.
G. Forge, Oxley	1,140	739 (to 7th November.)
J. Lye, Loomberah	866	801 ,,
C. Luckett, Duri	1,026	430 (To August.)
S. Pollock, Quirindi	623	1,009 (To 7th November.)
J B Pearson, Murroon	150	530 ,,
W. Lye, Loomberah	260	806 ,,
I. Thornton, Currabubula	Nil	134 (To September.)
R. Winnett, Warrah Creek	Nil	1,298 (To 7th November.)
W. Bignall, Manilla	266	889 ,,
Thrift Bros., Parkville	480	...
Scott Bros., Currabubula	200	225 (To September).
V. Reading, Duri	160	678 (To 30th October.)
W. Donaldson, Currabubula	Nil	357 (To October.)
W. Smith, Warrah Creek	285	620 ,,

Comment.

Generally, best results were obtained from brown, spongy, slightly self-mulching medium loams. There was an absence of bunt disease in the plots all the grain having been treated with copper carbonate. The chief diseases were flag smut (which was most prevalent, though not to a serious degree

in the crops, the varieties showing least infection being Nabawa, Wandilla and Currawa) and the take-all and foot-rot group of diseases which were also seen, though rarely.

The grain harvested was generally of very good quality. There was nothing outstanding between varieties as to drought resistance, although Aussie was generally more tipped than other sorts.

Cultural Details.

Oxley (G. Forge and Son).—Soil, red; part self-mulching, medium loam from shale, denser soil at 6 inches. First cropped 1907; nine crops of wheat five years of fallow. Mouldboard ploughed 4½ inches deep in July; spring-toothed 4 inches deep in December and 3½ inches in February; sown with combine 2nd May; harrowed 3rd May. Seed-bed moist and of good tilth; seeding 43 to 58 lb.; no fertiliser applied; harvested 18th November.

Murroon.—Soil, grey to black self-mulching heavy loam from basalt; for previous two years had grown wheat manured with superphosphate at 56 lb. per acre. Mouldboard ploughed late January 3½ inches deep and again mid-February; harrowed 6th April; springtoothed 23rd April; harrowed prior to sowing. Sown with combine 9th-10th May. Seed-bed moist and crumbly. Seeding, oats 42 lb., wheat 60 lb ; no fertiliser applied in variety trial; harvested November. Buddah oats shed freely very shortly after maturity.

Loomberah (W. J. Lye.)—Soil, grey to red medium loam from shale; shaley clay subsoil at 6 inches. Previous crop, wheat in 1926. Springtooth cultivated late in January, again 1st week in March, and again 1st week in April, 3½ inches deep. Sown with combine 27th April to 1st May with wheat at 50 lb, and oats 40 lb. per acre; no fertiliser. Crop fed-off bare late in June; harvested mid-November.

Loomberah (J. Lye).—Soil, red brown self-mulching; in part medium loam from shale, subsoil clay at 6 inches. Cropped many years. Mouldboard ploughed August 4 to 5 inches deep, springtoothed mid-September to ploughing depth and harrowed, springtoothed January 4 inches deep; disced February 3 to 4 inches deep and harrowed; springtoothed 3½ inches deep and harrowed late in March; springtoothed April 3 inches deep; combine sown 26th April to 3rd May. Seed-bed moist and well consolidated. Seeding 50 lb. per acre, not fertilised; portion harrowed after sown; harvested November. The soil where Pusa, Yandilla King, Wilfred, and Wandilla were located was not as favourable as for the balance.

Attunga (J. H. Pankhurst).—Soil, grey to red from shale, tendency to set; last crop Algerian oats in 1925 unfertilised. Mouldboard ploughed early in September 4 inches deep and again in mid-October, springtoothed 2½ inches deep end of April; sown 11th-12th May. Seed-bed over set in part and moisture deficient; seeding oats 43 lb., wheat 52 lb. per acre without fertiliser.

Generally a thin uneven stand; sheeped late June especially to even growth. Rate of seeding and oat trial harrowed after sowing on account of coarse nature of soil; harvested in November. No reliable data was available owing to thin uneven stand. Buddah oats shed a little.

YIELDS in Wheat Variety Trials.

	Oxley. (G. Forge and Sons).	Murroon	Loomberah (W. J. Lye).	Loomberah (J. Lye).	Manilla	Parkville	Warrah Creek (R. Winnott).	Quirindi.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Yandilla King ...	2⅕	5⅕	20	10⅕	5½	13	12¼	36⅓
Bena ...	1¾	...	17	24⅕	...	...	...	...
Aussie ...	2	3⅓	23	7¼	6½	9	12½	25½
Canimbla ...	1⅙	...	...	...	...	...	...	...
Ghurka ...	1½	...	...	...	...	...	...	...
Nabawa ...	3	...	29	...	...	...	...	36½
Canberra ...	...	4	21	13½	4	...	...	...
Hard Federation	...	5⅓	21	...	4⅓	...	...	...
Duri ...	...	4½	...	12½	...	...	...	32
Florence ...	...	...	14½	7⅓	...	...	...	...
Rattling Jack ...	...	...	18	...	...	...	...	...
Currawa ...	...	...	16½	17½	...	19	18	...
Waratah ...	...	...	21⅓	16¼	8½	13⅓	...	24
Wandilla ...	...	...	22⅔	6⅓	4½	...	...	...
Cadia ...	...	...	21	...	...	...	...	...
Canimbla ...	...	...	21½	18	...	...	...	...
Union ...	...	...	21⅓	16¼	...	20	...	...
Binya ...	...	...	16	...	...	...	...	26
Clarendon ...	...	...	13	11¼	4½	...	11	...
Wilfred ...	...	...	16¼	5	...	...	...	...
Pusa 4 ...	...	...	...	8¾	...	...	...	...
Bald Early	...	...	...	...	5¾	...	10½	...
Major ...	...	...	...	...	...	...	14½	...
Gresley ...	...	...	...	...	...	...	13	...
Ford ...	...	...	...	...	...	...	...	39½
Ranee ...	...	...	...	...	...	...	...	28½
Rajah ...	...	...	...	...	...	...	...	44½
Boonoo ...	...	...	...	...	...	...	...	22½
Marshall's No. 3 ...	...	...	...	...	...	...	...	33½

Duri (C. and L. Luckett).—Soil, red self-mulching loam, partly shale and basaltic, denser subsoil at 6 inches. Cropped since 1911 without fertiliser. Mouldboard ploughed 4 inches deep in early August, springtoothed to the ploughing depth early in September, disced 3 inches deep early in October (the last two to destroy young wild oats); disced mid-January 3 inches deep, mainly to destroy thistles, paddy melons and oats; harrowed late January, springtoothed mid-March, harrowed early April, harrowed mid-April to destroy young stagger weed, springtoothed 3 inches deep early in May. Seed-bed in good condition, moisture showing at each cultivation and at

seeding on 14th to 16th May. Sown with combine which destroyed a thick plant of stagger weed just reaching the surface. Seed in variety trial at 53 lb. and in fertiliser trial 48 lb. per acre. No fertiliser in variety trial.

In late August to early September the crop was fed off close as sheep feed was needed and wild oats were prevalent in the crop in the balance of the paddock, and the grower was loathe to let them seed. The experiment crop at the time was not showing signs of deficiency of moisture and moisture was visible in the soil.

Currububula (I. C. Thornton).—Soil, medium grey loam, part prone to setting, part sandy; cropped with wheat in 1926—a late-sown low yielding crop—but not cropped for fourteen years previously. Sheeped till end of March, a covering, mainly stink grass, being kept close cropped. Mouldboard ploughed 3 inches deep mid-March, harrowed 21st April, harrowed 12th May; harrowed 23rd May 2½ inches deep with heavy harrows, springtoothed 2½ inches deep on 27th May, and harrowed 2½ inches deep. Sown 6th to 7th June at about 53 lb. seed per acre without fertiliser. By 5th September there was only a fair stand in the sandy portions and the rest was very poor. No rain of any value occurred till November and the crop dwindled away.

YIELDS in Wheat Fertiliser Trials.*

	Murroon	Manilla.
	bus.	bus.
56-66 lb. superphosphate	4	......
84 lb. superphosphate	......	5½
105 lb. P5	......	5½
Unfertilised	4½	4

* Canberra was the variety used.

Currabubula (S. J. Thornton).—Soil, grey, deep sedimentary mainly from shale formation. Previous crop wheat unfertilised, in 1926; sheeped and stubble burnt in January; disc ploughed 3 inches deep in January, harrowed early in March, springtoothed 2½ inches deep mid-March and again late in April. Sown 17th May with combine without fertiliser at 48 lb. per acre and harrowed Lightly fed off late August. The absence of rain caused partial failure and abandonment By early September the fertilised portions had made greater and denser growth than the unmanured and were equal in vigour.

Manilla.—Soil, light red to brown loam, self-mulching; subsoil 5 to 6 inches, fairly retentive. Previous crop oats, which produced abundant green feed; it was fed off till late August then a light crop of grain was harvested in November. Mouldboard ploughed 4 to 5 inches deep in January, springtoothed in March 4½ inches deep and again early in May 3½ inches deep; sown 10th to 11th May with combine and lightly harrowed; wheat at 60 lb. and oats at 40 lb. per acre.

Parkville (Thrift Bros.).—Soil, boulder clay loam and medium light loam; clay subsoil at 6 inches. Cultivated many years where fertiliser trial situated. Where variety trial located was previously pasture, mouldboard ploughed 4 inches deep in mid-December, harrowed in March, mouldboard ploughed 4 inches in April, springtoothed 3 inches in April and also in May. Sown 27th May with drill and harrowed; seeding at 60 lb. wheat, 50 lb. oats. Seed-bed moist. No fertiliser added.

Fertiliser section had grown wheat in 1926 unfertilised. Mouldboard ploughed in February 4 inches deep and again in mid-March; springtoothed 3 inches deep in April and again in May. Sown 23rd May; seeding 60 lb. per acre.

RATE of Seeding Trial.

Locality.	Variety.	Rate of seeding. 35 lb. per acre.	50 lb. per acre.	65 lb. per acre.	Remarks.
		bus.	bus.	bus.	
Loomberah (W. J. Lye) ...	Waratah ...	15	17	16	Crop patchy.
" ...	Wandilla ...	18¼	17½	18¼	
Duri* (A. E. Burcher) ...	Gresley	4	4¾	5¼	

* The rates in this instance were 36, 53 and 70 lb. per acre respectively.

Warrah Creek (R. Winnett).—Soil, dark chocolate to black, heavy self-mulching loam from basalt; previous crop wheat unfertilised in 1926; stubble burnt, mouldboard ploughed late March 3 to 4 inches deep, again early in April 2½ inches. Sown 6th to 9th June at 60 lb. per acre; crop fed off late August to late September by cows and was partly pulled up—mainly the early maturing varieties. Subsequent rain caused a growth to 2 feet 6 inches with good stooling in late maturing varieties.

Quirindi (Smith-Pollock).—Soil, black, deep clay loam, self-mulching. Previous crop, wheat unfertilised in 1925—a 4-bag crop. In 1926 sheeped till autumn when a fairly dense crop of herbage, mainly variegated thistle appeared. By September this was 2 to 3 feet high and the ground was then disc ploughed a full 6 inches. Mouldboard ploughed 3½ inches in January when moist, springtoothed in March 3 to 3½, inches harrowed day before sowing. Sown 9th to 12th May with combine and all harrowed. Seed at 60 lb.; moisture plentiful and condition of seed-bed good. The crop reached maturity from 10th to 23rd November; the early-maturing varieties had about 1½ inches effective rain less than others. This was the best all round crop seen in the northern district for the season. Rain and wind shattered the oat plots, which was cut as a whole for hay.

Currabubula (Scott Bros.).—Soil, red, medium loam from basalt, heavier subsoil at 5 inches; previously cropped for many years. Sheeped and stubble burnt in January, mouldboard ploughed 4 inches deep in January and

harrowed shortly afterwards; grazed with sheep; springtoothed 3 inches deep in mid-May; sown 16th May with disc drill. Stand which resulted was abandoned for sheep feed, the rainfall continuing insufficient.

Duri (A. E. Burcher).—Soil, red medium loam from shale; subsoil heavier at 5 to 6 inches; cropped for thirty years; land never been fertilised. Mouldboard ploughed 4 inches deep in December and January, after land had been to pasture and herbage, mostly clover and weeds, for two years. Harrowed after rain in February, harrowed after rain in March and then disced 3½ inches deep; sown 13th May with combine; seed-bed on dry side but good tilth.

Oxley (Titcume Bros.).—Soil, red to brown medium loam from shale, slightly to liberally self-mulching; subsoil denser from 5 inches. Wheat grown each year since 1924 unfertilised; stubble fed and balance burnt; mouldboard ploughed 4 inches in December, harrowed in January, springtoothed late February to ploughing depth, springtoothed 14th April; sown with combine without fertiliser 15th April and harrowed day following. Seed-bed in good condition. A fair cover resulted which was found valuable as sheep feed, weather conditions militated against profitable grain crop.

YIELDS in Oat Variety Trials.

	Manilla.	Parkville.	Duri (V. J. Reading).
Buddah	10¾	17	5
Guyra	10½	......	......
Mulga	......	19	......
Algerian	......	......	5
Fulghum	......	......	5
Belar	......	......	4

Duri (V. J. Reading).—Soil, black to brown, heavy, self-mulching loam from shale and basalt; heavier subsoil at 5 inches. Cultivated many years; in 1926 a 13-bag unfertilised crop. Sheeped, mouldboard ploughed January 4 inches when moist; springtoothed 3 inches on 24th April, harrowed next day. Sown 13th May with combine, 40 lb. seed per acre, no fertiliser. Harvested 5th December, the fairly abundant rains with wind caused lodging and considerable loss of grain; quite two-thirds the crop was lost.

Currabubula (W. B. Donaldson).—Soil, black, heavy, self-mulching loam from basalt, heavier subsoil at 5 inches; wheat for some years with take-all and foot rot showing in the last three years, especially in 1926. Stubble burnt, a poor burn. Mouldboard ploughed February 2 to 5 inches deep, soil dry and lumpy; harrowed after rain mid-March, mouldboard ploughed mid-April 4 inches deep, harrowed twice 29th April. Sown 16th May with disc drill drawing drag chain. Seed at 39 lb. per acre; no fertiliser. A fair strike resulted on portion, but the crop was very patchy and too thin in part for satisfactory comparison. The crop was stunted, being 3 inches

high early in September and not previously fed off. The rains of November revived it and good feeding off resulted to end December, Belar looking most promising.

Warrah Creek (W. Smith).—Soil, chocolate to black, self-mulching heavy loam from basalt. In 1926 wheat, the straw also being harvested for feed; previously cropped for some years. Mouldboard ploughed 4 to 4½ inches early in February, twice springtoothed late in March 4 inches deep. Sown 12th to 13th April without fertiliser at 1 bushel per acre. A fair stand resulted; fed off. Stock were removed mid-July with the object of allowing crop to seed, but rainfall proved deficient and the growth was fed bare.

RIVERINA DISTRICT.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting cereal experiments in the Riverina District:-

C. W. Moll, Gerogery.
Geo. Nation, "Greenbank," Jindera.
W. Goldsworthy, Walbundrie.
L. Wilson, "Kismet," Howlong.
E. Zeibarth, Brocklesby.
F. Knight and Sons, "Bolinda Glen," Corowa.
Geo. Perry, "Hillview," Holbrook.
C. Woodhouse, Glenroy, Tumbarumba.
McMillan Bros., "Bonnie Ville," Henty.
C. Campbell, "Avondale," Munyab a.
Wolter Bros., Ryan, *via* Henty.
T. Rodham, Uranquinty.
J. Gollasch, "Pine Park," Milbrulong.
E. H. G. Eldershaw, "Kywong," Old Junee.
W. Lawrence, "Redbank," Marrar, *via* Coolamon.
N. Mutton, Coolamon.
E. Hamblin, "Ravenstone," Ganmain.
M. J. Quilter, "Avondale," Sandigo, *via* Narrandera.
P. McLennan, "Forest Lodge," New Park (Morundah).
J. J. Hodgson and Sons, South Culliv l (Brookong).
F. McPherson and Sons, "Thononga," Jerilderie.
Geo. Maver, "The Park," Deniliquin.
M. H. Gale, "Cargo Station," Moulamein.
W. Glenn, "Maneroo," Mathoura (Bunaloo).
J. Tullock and Son, Finley.
W. Thornton, "Spring Farm," Berrigan.
C. Kerr, "Innes Vale," Oaklands.
T. McAuliffe, Gl nroy, Tumbaruml a.

The season, except in the eastern Riverina, was one of the worst experienced for over forty years. In certain parts of the eastern Riverina, such as the Albury, Brocklesby and Henty districts, a moderately dry season rather favoured, and the strip of country from Howlong across to Albury and Holbrook, and for a considerable distance up the main line towards Wagga, received much more favourable conditions than all the country a very few miles west. In most parts the season was, from some aspects, more severe than those of 1902 and 1914. The previous summer was dry right through, and there was just sufficient rain in May to give a patchy germination. This was

followed by severe dry cold conditions through the winter, with numerous frosts in succession, and in many parts the crops had to hang out till the end of September before any relief came. By the fourth week in September most of the crops were thought to be failures; up till 29th September most districts had had considerably less than half their average annual rainfall for the year. Under these conditions the crops on the open black soil plains of Brookong and Moulamein failed absolutely. The yields on some of the western plots were very low, but they have given valuable information.

The following tables give the seasonal rainfalls :—

RAINFALL during Fallow and Growing periods.

	On Fallow.										On Crop.								
	July, 1926.	August.	September.	October.	November.	December.	January, 1927.	February.	March.	Total.	April, 1927.	May.	June.	July.	August.	September.	October.	November.	Total.
Gerogery (Culcairn).	165	250	167	247	6	111	121	25	22	1,114	5	148	56	191	236	48	377	39	1,100
Jindera ...	237	331	263	208	61	146	197	47	85	1,525	16	250	67	362	353	70	403	51	1,572
Walbundrie ...	127	264	172	173	5	147	148	55	15	1,106	4	129	52	219	186	65	305	40	1,000
Howlong ...	248	309	143	199	26	90	189	49	30	1,282	8	211	59	209	459	88	433	57	1,524
Brocklesby ...	131	273	183	148	29	107	175	37	22	1,105	4	123	68	220	158	128	240	47	984
Corowa ...	160	269	171	153	24	32	118	58	16	1,001	5	199	45	152	239	93	317	58	1,108
Holbrook ...	244	326	217	207	26	173	127	35	18	1,373	19	213	113	242	326	54	284	74	1,325
Tumbarumba	365	341	175	384	107	182	318	41	39	1,952	45	404	82	367	528	38	467	176	2,107
Henty... ...	151	263	150	235	8	116	112	37	18	1,090	13	181	59	183	267	86	377	41	1,207
Munyabla ...	149	240	183	189	15	19	98	29	16	938	11	138	55	244	196	182	252	34	1,112
Uranquinty (The Rock).	170	283	231	196	33	160	97	38	15	1,223	82	174	79	180	234	56	364	39	1,208
Milbrulong ..	153	322	213	168	15	71	71	76	11	1,100	25	147	92	128	215	23	174	38	842
Coolamon ...	218	160	145	168	10	106	99	10	15	931	50	145	79	153	150	129	337	106	1,149
Ganmain ...	209	202	287	197	50	100	155	12	5	1,217	57	142	54	155	132	98	34	105	778
Narrandera ...	150	218	58	172	15	111	36	7	8	775	15	113	59	127	141	68	302	36	861
Morundah ..	140	232	84	149	45	138	54	23	9	874	17	124	65	117	145	186	186	31	8.1
Urana (Brookong).	110	198	189	...	5	67	85	35	13	702	5	114	44	122	150	108	310	34	887
Jerilderie ...	69	209	92	116	...	56	41	53	12	648	2	94	42	106	163	66	182	31	686
Deniliquin ...	92	251	131	167	13	94	8	55	9	820	1	116	66	167	138	76	178	41	783
Moulamein ...	126	194	66	94	...	109	9	32	24	654	...	87	79	119	69	122	191	99	766
Mathoura ...	70	120	58	113	4	10	...	...	9	384	...	90	41	165	113	67	142	58	676
Finley... ...	93	174	95	127	2	69	85	72	9	726	...	103	48	157	153	106	190	69	826
Berrigan ..	88	154	134	137	12	38	119	72	11	765	2	96	46	142	136	78	165	26	685
Oaklands ...	130	218	225	163	16	56	100	51	28	987	..	148	56	149	159	107	271	58	948

Cultural Details.

Gerogery.—Red loam derived from granite, basalt, and a little ironstone, average depth about 8 inches with clay subsoil; old cultivation paddock, previous crop oats; mouldboard ploughed 4½ inches August, harrowed October, scarified January and again in May; combine sown 12th May on good seed-bed; Bena and Yandilla King at 65 lb., and Waratah, Canberra, Gresley, Bomen, and Union at 75 lb. seed, superphosphate at 85 lb.; harvested 8th December.

Jindera.—Soil, red loam, similar to Gerogery; old cultivation paddock, previous crop oats, 1922; mouldboard ploughed 4½ inches September, harrowed November, springtoothed full depth December, harrowed January, all workings after rain; late varieties sown 27th April, early varieties 16th May; Sunrise and Myall oats sown 22nd May after 80 points rain; sown

with combine and harrowed; Yandilla King, Turvey, and Marshall's No. 3 at 65 lb. seed, rest of wheats at 75 lb.; oats at 60 lb. seed; 86 lb. superphosphate on wheats and 28 lb. on oats; harvested 10th December.

Walbundrie.—Red heavy loam derived from granite, basalt and ironstone, some of it semi-silty formation; average depth about 8 inches with clay and gravel subsoil; old cultivation paddock, previous crop wheat on stubble, 1924; mouldboard ploughed July, 4½ inches, harrowed August, disced October, scarified January; combine sown; Turvey, Yandilla King and Bena on 27th April at 65 lb. seed, rest of wheat on May 14th at 75 lb. seed; oats on 30th April at 60 lb. seed. Superphosphate on wheat, 84 lb. and on oats 38 lb.; harvested 14th December.

Howlong.—Dark red silty loam, river country near Murray, average depth 6 inches, clay subsoil; old cultivation land, previous crop, wheat 1923; mouldboard ploughed 5 inches September, harrowed October, scarified November, March and April, harrowed April; combine sown 29th April, wheat at 75 lb. seed, superphosphate at 95 lb. per acre; harvested 1st December. Plots heavily fed-off in July; considerable loss in Canberra from loose smut, and Waratah shed about 1 bushel.

Brocklesby.—Red loam, derived from granite, basalt and a little ironstone; average depth, 8 inches, clay subsoil; old cultivation land, previous crop oats; summer fallowed; mouldboard ploughed February 4½ inches and harrowed, skim ploughed September, harrowed October, springtoothed February; combine sown; late wheats on 16th and early wheats 26th May; 75 lb. seed, and 84 lb. superphosphate; harvested 3rd December. The dry season suited this district, but it was extra dry, and there is no doubt the summer fallowing helped considerably in the resultant excellent yield. Bena and Yandilla King had a poor strike, and were rather thin; Waratah shed a good deal.

Coroua.—Red loam, average depth 6 inches, clay subsoil; old cultivation paddock, cropped for forty-six years; mouldboard ploughed 4½ inches August, harrowed and springtoothed October, springtoothed again May; hoe drilled; wheat sown 25th May, at 75 lb. seed and 84 lb. superphosphate, oats on 31st may at 60 lb. seed and 56 lb. superphosphate; harvested 6th December. Oats were very difficult to harvest and a good deal was lost by shedding and lodging.

Holbrook.—Dark red loam, heavy, semi-silty, average depth 6 inches, clay subsoil, inclined to pipeclay in parts; old cultivation; mouldboard ploughed August, harrowed October, springtoothed February, skim ploughed March and harrowed, harrowed May, combine sown 18th May, wheat at 66 lb. seed and 84 lb. superphosphate, oats at 48 lb. seed and 56 lb. superphosphate; harvested 10th December.

Tumbarumba (C. Woodhouse).—Deep red loam, basalt origin and quartz; average depth 10 inches, clay subsoil; old cultivation (forty years), cropped continuously and only fallowed within the last five years; previous crop oats; springtoothed February, 1926, mouldboard ploughed 4½ inches August,

harrowed and stocked with sheep, disced November, scarified February and May; combine sown 21st May and 1st June at 70 lb. seed and 90 lb. superphosphate; harvested 1st January.

Henty.—Dark red heavy loam, semi-silty, average depth 8 inches, clay subsoil; old cultivation; previous crop oats; mouldboard ploughed 4½ inches early May, disced October, harrowed, scarified April; combine sown 20th May (Yandilla King on 4th May); wheat at 75 lb. seed and 84 lb. superphosphate, oats at 56 lb. seed and 60 lb. superphosphate; harvested 14th December. Nabawa had a bad strike.

Munyabla.—Red loam, granite and basalt origin, average depth 8 inches, clay subsoil; old cultivation, previous crop oats on stubble; mouldboard ploughed 4½ inches July, springtoothed September and February; combine sown 13th May, wheat at 75 lb. and 80 lb. superphosphate and oats at 60 lb. with 50 lb. superphosphate; harvested 6th December.

Ryan.—Soil similar to Munyabla; mouldboard ploughed 4½ inches August, springtoothed September and February, harrowed April; combine sown 5th May at 73 lb. seed and 75 lb. superphosphate; harvested 1st December.

Uranquinty.—Red loam, derived from granite and basalt, average depth 9 inches with clay subsoil; old cultivation; mouldboard ploughed 4½ inches May and harrowed, springtoothed September, disced February, springtoothed twice before sowing; combine sown 25th May, at 75 lb. wheat and 84 lb. superphosphate, and 60 lb. oats and 84 lb. superphosphate; harvested 9th December. Yields of oats reduced considerably by shedding.

Milbrulong.—Good red loam, derived from granite and basalt, average depth 7 inches with clay subsoil; old cultivation; previous crop oats; mouldboard ploughed 4½ inches early June, harrowed September, springtoothed end of September, scarified October, springtoothed November, scarified January, springtoothed March; combine sown 19th May at 68 lb. wheat, and 84 lb. superphosphate, and 56 lb. oats and 74 lb. superphosphate; harvested 6th December.

Old Junee.—Red loam, granite and volcanic origin, average depth 7 inches with clay subsoil; old cultivation; mouldboard ploughed 3½ inches June, scarified early September, scarified October and January, sheep run on fallow in between cultivations; combine sown 15th to 18th May at 75 lb. wheat and 90 lb. superphosphate, and 50 lb. oats and 50 lb. superphosphate; harvested 5th December. These plots were considerably improved after a patchy germination by harrowing.

Marrar.—Red loam, similar to Old Junee; old cultivation; mouldboard ploughed June, harrowed August, springtoothed October, disced January, scarified early May and harrowed; combine sown 20th May and harrowed; 70 lb. wheat and 90 lb. superphosphate, and 60 lb. oats and 90 lb. superphosphate; harvested 3rd December. There is no doubt the discing in January, although necessary on account of weeds, had a deleterious effect on the wheat yield.

Coolamon.—Red loam, similar to Old Junee, new ground; mouldboard ploughed September, harrowed October, springtoothed January, spike rolled January, combine sown 23rd May, wheat at 75 lb. and 60 lb. superphosphate, oats at 60 lb.; harvested 11th November.

Narrandera.—Red loam, heavy plain, average depth 6 inches with clay subsoil; old cultivation; mouldboard ploughed August and harrowed, springtoothed and harrowed October; combine sown 20th May, wheat at 75 lb. and 84 lb. superphosphate; oats at 45 lb. and 60 lb. superphosphate; harvested 5th December.

Ganmain.—Heavy red loam, box country, average depth 6 inches with clay subsoil, old paddock; disced 3 inches end January, springtoothed and harrowed March, combine sown 23rd May and harrowed; seed 52 lb. per acre; spike rolled end August; harvested 15th November. This was a manurial trial with oats and was sown on wheat stubble. The spike rolling at end of August improved the crop considerably.

Morundah.—Heavy red loam, box and bull oak country, average depth 6 inches with clay subsoil, old cultivation; mouldboard ploughed August, harrowed August, scarified September, springtoothed October, scarified May, combine sown 25th May, harrowed 13th June when crop was just up; wheat sown at 75 lb. with 84 lb. superphosphate, oats at 60 lb. with 56 lb. superphosphate; harvested 4th December.

Jerilderie.—Heavy black soil plains, open and inclined to be self-mulching. same soil for considerable depth; new land, first crop; disced February, disced September and again in November, smoodged April, springtoothed May; hoe drilled 19th May, soil in very good order; wheat at 76 lb. with 85 lb. superphosphate, oats at 60 lb. with 45 lb. superphosphate; harvested 1st December. This country seemed to dry right out in the early winter, and was not expected to yield anything; all the oats except Mulga and Sunrise failed.

Deniliquin.—Dark, heavy clay loam, inclined to be self-mulching, of considerable depth, boree country; new land; disc ploughed August, scarified January and harrowed, spike rolled May; combine sown 6th May, wheat at 75 lb. with 84 lb. superphosphate, oats at 60 lb. with 56 lb. superphosphate; harvested 1st December.

Mathoura.—Heavy red clay loam, plain country, average depth 6 inches with clay subsoil, old cultivation, previous crop oats; summer fallowed, disced February, mouldboard ploughed 3½ inches July and harrowed, springtoothed deeply in September, cross harrowed October, spike rolled and harrowed before sowing with combine on 27th April, harrowed after sowing; seed wheat at 75 lb. with 84 lb. superphosphate, oats at 60 lb. with 56 lb. superphosphate; harvested 30th November.

Finley.—Heavy red loam, box and bull oak country, average depth 6 inches with clay subsoil, old cultivation; disc ploughed August, smoodged September, harrowed September, springtoothed October and January,

harrowed January, springtoothed May, combine sown 9th June, wheat at 65 lb. with 95 lb. superphosphate, oats at 40 lb. with 65 lb. superphosphate; harvested 1st December.

Berrigan.—Heavy red loam, box and bull oak country, average depth 6 inches with clay subsoil, old cultivation; mouldboard ploughed June and harrowed, harrowed August, scarified twice in September, again in April, harrowed end April; hoe drilled 4th May, wheat at 78 lb. with 80 lb. superphosphate, oats at 60 lb. with 60 lb. superphosphate; oats harvested 28th November, wheat harvested 3rd December (Federation, Union and Gallipoli on 14th December).

Oaklands.—Red loam, pine and box country, average depth 7 inches with clay subsoil; third crop, previous crop wheat on stubble; mouldboard ploughed August, harrowed September and October, springtoothed October and January, spike rolled May; combine sown 2nd May, wheat at 70 lb. with 84 lb. superphosphate, oats at 60 lb. with 56 lb. superphosphate; harvested 1st December. The yield of Canberra was considerably reduced by loose smut.

Tumbarumba (T. McAuliffe).—Red loam. basalt origin, mixture of quartz, average depth 9 inches with a clay and gravel subsoil; old cultivation; mouldboard ploughed September, pulverised November, springtoothed January and May; hoe drilled 13th May. Myall and Algerian sown at 60 lb. per acre, the remainder at 80 lb. with 90 lb. superphosphate. Hay harvested 3rd December, early oats stripped 10th December, later ones on 20th December.

The soils at each centre were typical of the district. The plots on the black soil plains at Brookong and Moulamein failed. The soils dried right out, and no rain to speak of came till the end of September. An oat manurial trial with Quandong oats at Mathoura also failed.

Notes on Wheat Varieties.

The season was hard on the early wheats, which shot their heads up and for a while looked as if they would be the only ones from which any grain would be taken off. When the rains came, however, the late wheats responded much better, and in most cases finished better than the early ones. The latter already had their heads formed in the sheath, and consequently most of the heads were short; later in the season a good many short green heads came (second growth), and in waiting for these a good deal of the grain was lost. The season was one of surprises; of the early wheats, some of those that appeared to have wilted the most responded and finished better than some similar early ones that appeared in better condition; Aussie was a case in point.

Turvey has been about the most popular mid to late wheat for the Riverina, but it is now slowly but surely being replaced by Marshall's No. 3 and Yandilla King. It is always deceptive, and this year also did not yield up to expectations except in one or two instances. These two later

wheats have proved themselves a good pair for early sowing for general purpose wheats. Marshall's No. 3 appears to suit certain localities better than Yandilla King.

It was a Federation year, and this variety did well everywhere. It is still holding its own in the drier districts.

Canberra did not do well, and in most places is being superseded by Waratah. It appears too disease-liable and weak in the straw for this district. Although Waratah shed a good deal this year, it shows up as the best early wheat for general purposes if sown in season. It should be sown as late as possible.

Gresley was too early for the season and did not get a proper chance, but it is doubtful if it can stand up against Waratah, except for an early piece of good green hay.

Of the newer wheats, two stand out prominently—Union and Nabawa. The former is purely a grain wheat, but is replacing Federation in Eastern Riverina. It has been in a prominent position for several years. Nabawa appears to be a dual purpose early variety. Its outstanding feature is that it is practically 100 per cent. flag-smut resistant, and this year it yielded very well indeed. This dry season may have suited it, but it will be tried again to determine its behaviour in more normal years.

Cadia did very well as a late wheat for the cooler portions and for hay. Bena was surprising at some centres, although the stand of this variety was thin, it yielded rather well in many parts, and should do better in a normal year.

Aussie finished well and showed great promise. It should replace Canberra as an early wheat for the drier parts. Other varieties that showed great promise was Gallipoli, Rajah, Ranee, Nizam, and Duchess.

Diseases.

There was very little foot-rot or take-all present anywhere, but loose smut and flag-smut were prevalent. Loose smut was especially prevalent in Canberra.

All the plots were dry-pickled, and no bunt or ball smut was seen in any of them. Rust and mildew were entirely absent on account of the season. A little septoria or leaf blight was present, but not at any place in sufficient quantity to do any appreciable damage.

Wheat Manurial Trials.

Early in the season the most heavily manured plots showed out remarkably well, but after the rains many of the plots more lightly manured caught up and finished even better. The trials confirm what has already been gleaned—that a great deal depends on the district. In some parts, Milbrulong for instance, an application of 112 lb. of superphosphate has given an increase over 84 lb. of roughly 3 bushels per acre for three years, good

YIELDS of Wheat Variety Trials and Pure Seed Areas.

Variety.	Gerogery.	Jindera.	Walbundrie.	Howlong.	Brocklesby.	Corowa.	Holbrook.	Tumbarumba. (C. Woodhouse.)	Henty.	Munyabla.	Ryan.	Uranquinty.	Milbrulong.	Old Junee.	Marrar.	Narrandera.	Morundah.	Jerilderie.	Deniliquin.	Mathoura.	Finley.	Berrigan.	Oaklands.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yandilla King	32 35	27 15	22 06	39 15	33 38	25 18	...	...	25 29	27 56	30 18	27 44	29 35	...	...	12 40	...	...	...	...	...	...	22 25
Bena ...	30 09	33 05	18 26	...	30 40	27 25	...	28 25	30 41	26 35	...	34 25	24 16	27 10	20 14	12 03	...	9 01	...	7 03	...	...	18 12
Union ...	32 35	41 38	22 34	...	41 18	31 35	32 00	...	30 05	28 8	...	30 06	28 46	32 45	...	10 03	14 30	9 01	5 55	9 45	9 11	12 23	27 11
Waratah ...	30 06	31 25	24 10	33 27	32 52	25 10	34 50	...	28 17	24 45	27 00	26 23	25 06	23 20	19 11	11 52	14 18	4 31	7 16	9 26	...	12 50	19 01
Canberra ...	25 07	26 42	17 09	33 09	40 25	23 43	31 49	30 35	24 06	20 00	24 00	25 25	22 50	21 31	...	10 33	12 07	7 00	4 17	11 49	12 37	8 32	17 36
Bomen ...	28 38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gresley ...	27 48	...	20 03	...	...	...	...	24 00	25 22	...	...	...	19 04	16 34	...	10 40	11 23	...	5 27	...	...	8 18	...
Turvey ...	...	27 10	14 17	...	35 42	25 3	...	32 15	...	24 20	...	...	25 47	...	23 31	...	...	...	...	...	...	...	...
Federation ...	...	32 02	...	33 24	...	31 36	32 55	...	...	...	27 00	...	26 45	28 16	...	11 18	14 19	7 52	7 55	13 40	10 42	15 01	...
Marshall's No. 3.	...	34 14	26 01	...	36 34	27 50	32 03	21 7	...	...	32 24	...	...	...	...	...	...	...	...	...	...	...	...
Aussie ...	...	29 08	27 32	...	...	...	...	...	...	29 36	...	...	...	...	20 50	...	...	...	6 55	...	...	...	...
Binya ...	...	26 11	...	...	...	...	...	...	...	...	...	...	...	...	15 39	...	...	...	...	...	...	6 50	...
Duri ...	...	...	23 45	...	...	...	...	...	...	...	...	...	...	28 17	...	13 43	10 13	...	...	9 32	...	12 51	...
Nabawa ...	...	...	27 42	...	...	31 27	...	...	26 33	...	...	...	28 35	...	...	16 07	...	...	...	...	...	...	...
Gallipoli ...	...	...	29 30	...	...	28 00	...	...	29 01	35 45	...	31 00	...	...	23 31	10 12	12 27	5 42	12 37	...	14 17	14 08	34 48
Rajah ...	...	...	...	...	41 10	...	...	...	...	...	...	...	...	...	...	8 08	15 30	...	...	...	...	...	...
Ranee ...	...	...	...	...	34 53	...	...	...	...	28 15	...	...	...	...	17 46	...	13 49	9 05	...	...	...	13 20	...
Barwang ...	...	...	...	...	...	23 21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nizam ...	...	...	...	...	...	...	36 28	...	...	...	...	...	...	...	...	...	...	7 10	10 25	11 08	24 15	...	30 45
Cleveland ...	...	...	...	...	...	...	...	30 00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cadia ...	...	...	...	...	...	...	...	33 45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Riverina ...	...	...	...	...	...	...	...	...	22 40	...	...	29 19	...	...	20 16	...	12 30	7 08	...	...	...	...	...
Boonoo ...	...	...	...	...	...	...	...	...	21 22	...	...	...	...	22 44	16 40	...	11 00	6 48	...	10 41	...	...	...
Ford ...	...	...	...	...	...	...	...	...	...	25 30	...	...	...	...	...	...	...	...	...	...	...	...	...
Wandilla ...	...	...	...	...	...	...	...	...	...	...	...	30 33	...	...	...	...	...	...	...	...	...	...	...
Onas ...	...	...	...	...	...	...	...	...	...	...	...	...	26 59	...	21 47	...	...	...	...	...	...	15 31	...
Bredbo ...	...	...	...	...	...	...	...	...	...	...	...	...	...	28 15	...	...	...	...	7 25	...	...	...	...
Duchess ...	...	...	...	...	...	...	...	...	...	...	...	...	...	28 18	...	...	...	...	...	...	...	...	28 37
Merredin ...	...	...	...	...	...	...	...	...	...	...	...	...	...	23 15	...	...	...	...	...	...	...	...	...
Clarendon ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11 15	...	...	...	...	...	...
Ghurka ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12 19	...
Gluyas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9 28	...	...
Three Seas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19 21	...	...
Huff's Imperial.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10 34	...	...	...

years and lean. In other parts, more particularly the drier portions of the district, it has been found that the maximum benefits are obtained by an 84 lb. application and very little increase is gained by heavier application—in some cases even a depression is caused.

YIELDS of Manurial Trials with Wheat.

	Jindera (Turvey).	Walbundrie (Bena).	Corowa (Federation).	Tumbarumba (Marshall's No. 3).	Henty (Bena).	Uranquinty (Waratah).	Milbrulong (Waratah).	Old Junee (Bena).	Morundah (Federation).	Berrigan (Federation).	Mathoura (Union.)
	bus. lb.	bus. lb.	bus. lb	bus. lb	bus. lb	bus. lb	bus. lb.	bus. lb	bus. lb.	bus. lb	bus. lb.
Superphosphate at 56 lb. per acre	...	17 22	25 19	33 36	...	24 08	...	25 45	11 38		8 42
„ 65 „	26 40	...	...	...	26 21	...	...	...	...	10 41	...
„ 84 „	...	18 28	31 36	...	30 41	26 23	25 06	27 10	14 10	12 14	9 45
„ 96 „	27 10	...	...	38 45	...	...			...	14 19	...
„ 112 „	...	19 31	29 18	...	28 15	28 16	28 06	24 02	15 06		[illegible] 4
„ 120 „	31 51	...	...	...	...	...	...	...	...	15 01	...
„ 140 „	...	...	...	...	...	...	29 29	...	...	...	...
No manure	...	...	23 05	...	...	...	...	...	...	...	...

Rate of Seeding Trials with Wheat.

The rates of seeding show that the most suitable rate for early to mid-season varieties, is 75 lb. per acre, and that very little benefit is obtained by heavier seeding; in fact, sometimes a depression is caused. In one or two cases where the strike was bad, the heavy seeding of 85 to 90 lb. showed to advantage, but this rate should only be advisable during a very dry seeding.

YIELDS of Rate of Seeding Trials with Wheat.

	Walbundrie (Waratah).	Corowa (Waratah).	Tumbarumba (Marshall's No.3).	Henty (Waratah)	Uranquinty (Waratah).	Old Junee (Waratah).	Morundah (Waratah).	Berrigan (Union).	Mathoura (Federation).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
ed at 60 lb. per acre. ...	...	...	...	22 41	...	22 34	...	...	...
„ 65 „ ...	21 45	25 41	...	...	24 09	...	13 27	12 02	9 38
„ 70 „ ...	...	...	...	28 17	...	...	...	...	...
„ 75 „ ...	24 10	25 10	38 45	...	26 23	23 20	14 18	12 23	13 40
„ 80 „ ...	...	...	...	30 20	...	...	...	...	...
„ 85 „ ...	25 20	24 01	...	...	30 09	...	14 19	14 00	9 25
„ 90 „ ...	...	...	39 18	...	...	...	...	...	...
„ 100 „ ...	...	...	...	...	...	22 02	...	...	...

Notes on Oat Varieties.

Algerian is still the best dual purpose late oat for most of the district, except the drier parts. In some cases, Lachlan and Guyra, yielded much better, but the season was abnormal. These three varieties will be tried together again. Lachlan and Guyra showed up particularly well this season.

Mulga is still the best early oat, but Myall and Gy. showing promise, as is Belar, which has characteristics that should n od sort f

YIELDS of Oat Variety Trials.

	Algerian.	Belar.	Lachlan.	Mulga.	Guyra.	Myall.	Sunrise.	Buddah.	Gidgee.	Kelsall's.	Quandong.	Budgery.	Palestine.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Jindera	43 05	40 23	46 06	27 38	63 25	48 20	39 06	...	...	...	...	...	...
Corowa	31 28	...	31 03	38 22	29 19	...	32 21	31 02	23 05	...	...	...	..
Holbrook... ...	44 09	37 34	55 12	32 31	54 15	...	...	34 12	...	...	...	...	...
Henty	50 00	...	45 30	40 20	37 20	...	28 05	25 10	34 05	...	...	...	...
Munyabla ...	47 08	...	56 12	44 14	53 04	...	28 20	25 12	...	...	...	...	...
Uranquinty ...	21 00	16 26	19 07	24 16	...	...	10 28	...	...	...	...	...	...
Milbrulong ...	27 27	29 34	29 11	31 36	...	...	...	25 20	29 27	...	...	...	...
Old Junee ...	32 05	...	...	21 17	...	...	...	27 27	...	23 33	...	...	...
Marrar	43 30	...	40 21	26 26	41 06	26 10	...	...	31 30	...	32 32	...	...
Narrandera ...	25 00	...	28 22	28 00	28 22	...	19 09	...	...	...	...	...	...
Morundah ..	11 25	12 32	16 32	15 08	...	...	...	10 06	12 38	...	...	...	...
Jerilderie ...	...	...	...	20 18	...	...	19 21	...	...	...	...	...	...
Berrigan .. .	20 25	...	18 08	16 06	...	...	14 00	15 23	...	...	...	18 27	...
Deniliquin ..	...	...	10 28	9 03	...	...	...	...	11 04	6 30	...	...	...
Finley	23 13	8 33	...	15 07	...	17 26	...	34 11	...	6 05	...	...	...
Oakland	...	23 12	...	22 27	...	...	...	21 25	17 38	...	...	...	...
Mathoura ..	12 32	12 00	10 16	...	...	...	...	...	...	...	8 15	...	11 00
Tumbarumba (T. McAuliffe) ..	[illegible] 21	53 0	..	55 32	71 3	61 21	52 36	57 2	59 10	...	...	..	...

YIELDS of Manurial Trials with Oats (Grain and Hay).

Manure per acre.	Uranquinty (Algerian).	Old Junee (Algerian).	Ganmain (Algerian—Hay).
	bus. lb.	bus. lb.	t. c. cwt. lb.
No manure	19 07	28 22	0 13 3 14
45 lb. superphosphate	......	32 05	....
84 lb. ,, ...	21 00	......	0 18 0 7
108 lb. ,, ...	......	......	0 19 0 14
142 lb. ,, ...	......	......	0 19 1 17
100 lb. *M5 mixture	21 35	32 03	0 19 3 19
85 lb. nitro-superphosphate	......	......	1 1 3 10
85 lb. basic superphosphate	......	......	0 17 2 9
56 lb. blood and bone plus superphosphate	......	......	1 0 0 1

* M5 consists of two parts superphosphate and one part sulphate of ammonia.

YIELDS of Hay Variety Trials.

	Coolamon.	Tumbarumba. (T. McAuliffe).
	t. cwt. qr. lb.	t. cwt. qr. lb.
Oats—		
Buddah	1 17 1 8	2 5 3 18
Algerian	2 1 2 2	....
Mulga	1 5 0	3 5 2 24
Sunrise	1 9 3 [illegible]	2 6 3 14
Belar	1 8 3 0	2 4 1 10
Gidgee	....	3 9 3 21
Guyra	....	4 3 1 9
Myall	....	2 17 1 6
Wheat—		
Yandilla King ...	1 17 0 13	....
Marshall's No. 3 ...	1 19 3 10	....
Cadia	3 1 2 12	....
Gresley	1 12 1 21	....
Baroota Wonder ...	3 6 2 12	....
Zealand	3 1 3 16	....

THE IRRIGATION AREA AND ADJOINING COUNTRY (Yanco End).

H. J. DARGIN, Agricultural Instructor.

The following farmers co-operated with the Department in conducting cereal experiments during the season 1927 :—

E. McKenzie, Brobenah, *via* Leeton.
T. C. Davies, "Parkside," Brobenah, *via* Leeton.
E. J. Lovell, Farm 25, Leeton.
J. H. Trethewey, Farm 40, Leeton.
W. Edwards, Farm 367, Leeton.
A. M. Amey, Farm 1,093, Murrami.
A. A. Rewell, Farm 314, Leeton.
E. Duruz, jnr., Farm 7, Yanco.
J. Barracluff, Farm 1,128, Murrami.
J. Oslington, Farm 353, Leeton.
J. Sippel, Farm 138, Leeton.
H. Black, Farm 53, Leeton.
Maybon Bros., Farm 1,159, Leeton.
J. E. Williams, Farm 56, Leeton.
A. E. Bowmaker, Farm 1,429, Gogeldrie.
J. Murdon, Farm 144, Leeton.
R. Farrar, Farm 796, Gogeldrie

Owing to the droughty conditions which prevailed the wheat variety trials failed on five properties and no records were obtainable.

The Season.

The usual seasonal rains commenced about the middle of March, 1926, and continued right through until the end of October. During the seven months following (until the end of May), only 191 points of rain were recorded; under such conditions the fallows suffered to a marked extent, and very little moisture was retained. The usual cultivations necessary to a well-worked fallow, could not be carried out owing to the dry conditions. A very poor and uneven germination of the earlier-sown varieties resulted on many parts of the non-irrigable portions of the area. During May, 103 points of rain fell, which was of great assistance to the germination of mid-season and late sowings, although poor stooling was generally the case; unfortunately droughty conditions continued right through the early growing stages of the crops until the end of September and early October, when 3½ inches of soaking rain fell. By this time the crops sown on the dry areas were in a very bad state; practically all of them had browned off, and a number of farmers had found it necessary to feed off their paddocks with sheep and other stock during August and September, as the natural pastures had burned up long before this, and this appeared to be the only means of obtaining some return for their labours.

After the October rains the wheat fields took a new lease of life, and on the heavier soils many crops of between 12 and 25 bushels per acre were harvested, while on the lighter loamy soils, where excessive heat without moisture had burned the weakened plants to a marked extent, crops of from 2 to 5 bags per acre were the rule.

On the irrigable country many splendid crops of both wheat and oats were harvested, although on this class of land also where water was not obtainable soon enough to assist the growth of the young plants during the dry period, the crops received a setback and reduced yields resulted. Many wheat crops grown under irrigation yielded between 30 and 35 bushels per acre, and as high as 44 bushels per acre of Yandilla King was obtained on Farm 314 Leeton.

The rainfall during the fallowing and growing period, was as follows:—

On the fallow—

May, 1926, 188 points; June, 146; July, 118; August, 216; September, 96; October, 189; November, 11; December, 86; January, 1927, 39 points; February, 22; March, 11—Total, 1,122 points.

On the crop—

April, 22 points; May, 103; June, 60; July, 110; August, 84; September, 91; October, 298: November, 43—Total, 811 points.

The Plots.

Brobenah (E. McKenzie).—Soil, red loam previously cropped on two occasions; mouldboard ploughed 4 to 4½ inches deep, springtoothed July, harrowed October, springtoothed early in February and harrowed in February; combine sown 29th April, seed 60 lb. and superphosphate 60 lb.; harvested middle of December. These plots were situated in a saddle between the hills at Brobenah where very severe drought conditions prevailed.

Brobenah (T. C. Davies).—Soil, a good red loam cropped for a number of years; mouldboard ploughed 4 inches in July, springtoothed early October and again in March, harrowed April; sown 14th May, 60 lb. seed and 60 lb. superphosphate; harvested 8th December.

Leeton (Farm 25).—Soil, red loam, cropped several times previously; disc ploughed 4 inches late in August and disced, harrowed May and springtoothed; sown end of May and harrowed, seed at 60 lb. and superphosphate at 60 lb.; 50 points of rain immediately after sowing. Harvested 27th December.

Leeton (Farm 40).—Soil, a light red loam which had been spelled for two years, previous crop being oats in 1924. Mouldboard ploughed 4 inches July, sundercut October, springtoothed December; combine sown 15th May and lightly harrowed; seed at 60 lb. and superphosphate at 60 lb. per acre; harvested 4th January, 1928. The grain of Federation, Boonoo and Union was badly pinched, but that of Three Seas was a good plump sample.

Leeton (Farm 367).—Soil heavy red clay, new land, irrigable country; mouldboard ploughed 4 inches winter of 1925 and left in the rough owing to heavy rains; ploughed 4 inches again in winter of 1926, harrowed during the summer after rain, springtoothed early in May and combine sown 26th May at 60 lb. seed and 75 lb. superphosphate. One watering was given early in September, but water was not received as early as required by the plots, and all varieties received a setback from which they never fully recovered. Harvested 12th December.

YIELDS of Wheat Variety Trials.

Variety.	Yanco.	Leeton.				Brobenah.		Murrami.	
	Farm 7.	Farm 314.	Farm 367.	Farm 40.	Farm 25.	T. C. Davies.	E. McKenzie.	Farm 1,126.	Farm 1093.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bald Early ...	...	...	...	...	...	...	11 16	...	...
Baroota Wonder	...	20 13	...	...	12 0	9 33	...	...	18 10
Bena	6 43	...	22 5	...	...	...	11 23	23 18	...
Binya	...	...	...	...	...	...	...	23 12	...
Bobin	...	...	...	...	...	13 44	...	...	...
Boonoo	2 48	...	...	8 42	...	11 2	...	...	...
Canberra ...	6 32	...	18 30	...	...	...	7 51	24 42	...
Clarendon ...	...	22 2	...	...	...	...	...	...	...
Currawa ...	...	...	...	...	25 15	...	...	...	...
Duri	2 4	...	23 0	...	...	11 36	9 35	...	...
Federation ...	...	...	24 30	8 12	...	12 1	...	37 48	...
Gallipoli ...	...	...	...	...	...	...	6 41	...	...
Ghurka	...	...	...	...	...	12 37	...	...	...
Gluyas Early ...	...	...	...	...	...	12 38	11 41	...	...
Gresley	6 2	...	...	...	...	...	...	...	...
Hard Federation	...	...	...	...	21 32	...	...	31 36	...
Major	...	32 4	...	...	...	...	...	...	...
Onas	...	35 47	...	...	...	...	...	...	...
Penny	...	...	...	...	...	...	...	...	30 4
Riverina ...	...	...	...	...	...	...	10 29	...	...
Turvey	...	13 13	...	...	17 8	...	...	...	24 13
Three Seas ...	...	...	...	8 48	...	6 4	...	...	...
Union	...	28 2	...	8 30	21 6	...	...	...	...
Wandilla ...	...	35 18	...	...	19 40	...	...	...	...
Waratah ...	...	...	28 15	...	...	11 42	12 49	30 12	...
Watchman ...	...	...	...	...	...	9 6	...	...	...
Yandilla King ...	...	44 0	...	...	16 30	...	...	...	27 6

Murrami (Farm 1,093).—Soil, red to grey clay, several crops previously grown under irrigation; mouldboard ploughed 4 inches in February and harrowed, springtoothed during May; a watering was given late in April, and the plots were sown at 60 lb. seed and 60 lb. superphosphate three weeks later followed by a harrowing. Harvested early December.

Leeton (Farm 314).—Soil, red to grey clay and irrigable; two crops only grown previously the last being oats in 1925; disc ploughed 4 inches deep in July and harrowed, disced and harrowed in October, irrigated early in April and springtoothed. Drilled 9th May and harrowed; seed at 60 lb. and superphosphate at 70 lb.; harrowed five days later. Plot of Turvey was not watered prior to sowing, nor did it receive water early in September when all the other plots were irrigated. A few low lying patches in the plots of Major, Union and Onas were killed out after the watering and the heavy rains which fell during October. Baroota Wonder and Clarendon did not prove suitable for irrigation on this type of soil; they went down quickly and shed the grain freely. Harvested mid-December.

Yanco (Farm 7).—Soil, light red loam, several crops grown previously; mouldboard ploughed 4 inches deep end of May, springtoothed, drilled and harrowed on 21st June, seed at 60 lb. and superphosphate 60 lb.; harvested 18th December.

Murrami (Farm 1,128).—Virgin heavy red clay, irrigable; mouldboard ploughed 4 inches deep September and left in the rough; irrigated during February and Wimmera scarified; combine sown on 23rd May, seed at 70 lb. and superphosphate at 80 lb., and harrowed. One irrigation given early in September; harvested middle of December.

Comment on Wheat Varieties.

Considering the adverse seasonal conditions experienced on the Irrigation Area, critical comment on varieties is scarcely justified, as many of our best known and favoured wheats showed to little advantage over the newer and less widely grown varieties when grown under similar circumstances. Waratah, Yandilla King and Federation stood pre-eminent among the varieties tested on this portion of the Irrigation Area, more especially under irrigation, and some fine crops of Wandilla, Penny, Major, Union, Onas, and Currawa were also grown under irrigation, but scarcely a heavy yielding crop of any variety was to be found on the non-irrigable area. The small areas of Bena, Hard Federation, Duri, and Turvey sown this season gave fair yields only, on irrigable country; such varieties as Three Seas, Watchman, Canberra, Gresley, Bald Early, and Riverina which were all tested on dry areas made poor showing. Probably the outstanding wheat under all conditions during the past season was Federation.

Rate of Seeding and Superphosphate Trials.

This experiment was carried out on Farm 599 (Maybon Bros.), four different rates of seeding and superphosphate being tried, but the crops failed owing to droughty conditions and no records were kept.

A fertiliser test was carried out on Farm 7 (E. Duruz, junior), the variety used being Waratah sown at the rate of 60 lb. per acre. The results were as follows:—

Superphosphate at—	Yield per Acre. bus.	lb.
40 lb. per acre	7	40
60 lb. „	7	37
80 lb. „	6	33

The plot which received 80 lb. superphosphate per acre made slightly more growth after germination (which was fair on all plots), but on account of being slightly more advanced than the other two plots it suffered to a greater extent during the hot dry weather prior to the rain which fell late in September and early October.

Soil Improvement Trial.

This trial, on the farm of Mr. J. Barracluff, was carried out on virgin heavy red clay, irrigable land. The plots were mouldboard ploughed during September, left in the rough; irrigated during February and Wimmera scarified; gypsum applied on 20th May; sown with a combine on 23rd May and harrowed, 70 lb. of seed being used on all four plots; half an inch of

rain fell immediately after sowing; splendid germination on all plots and all stooled well. One irrigation was given on 3rd September and 3½ inches rain fell late in September and early in October. The two plots treated with gypsum made good growth throughout, became very dense and reached a height of just over 5 feet in the case of the one treated with the heavier application, and 4 feet 6 inches in the other case. The plot which received 80 lb. superphosphate only, made good growth throughout the growing period, and showed less straw than the gypsum treated plots but was not so dense. The plot which did not receive either gypsum or superphosphate did not do well after stooling, being a very weak and uneven crop throughout the trial.

Variety.	Gypsum per acre.	Superphosphate per acre.	Yield per acre.
	ton.	lb.	bus. lb.
Waratah	1	80	42 10
,, ...	½	80	34 20
,, ...	Nil	80	24 10
,, ...	Nil	Nil	12 15

Oat Grain Variety Trial.

An oat grain variety trial was carried out at Leeton (Farm 367). Soil, red clay; sown on 15th April at a depth of 2 inches at 60 lb. seed and 70 lb. superphosphate per acre. Crop fed off end of August. The yields were as follows:—

Variety.	Yield per Acre.	Variety.	Yield per Acre.
	bus. lb.		bus. lb.
Mulga	33 15	Buddah	28 12
Gidgee	32 20	Kelsall's	30 25
Budgery	28 20	Algerian	34 10
Guyra	31 0		

Oaten Hay Variety Trial.

A trial of oat varieties for hay was carried out at Gogeldrie (Farm 1,429) on irrigable land. The soil was mainly sandy loam, but ran out to a poor clay at one end; oats grown the previous year. Sown 17th May with seed at 60 lb. and superphosphate at 70 lb. per acre. Two waterings were given—on 8th and 27th September—and 3½ inches of rain fell early in October. Mulga lodged badly in places; Kelsall's and Mulga were ready to cut about the middle of October; Sunrise, Belar, and Algerian were ready a fortnight later, while Lachlan was last, being a week later. Harvested 11th November.

The yields were as follows:—

Variety.	Yield per Acre.	Variety.	Yield per Acre.
	t. c. q. lb.		t. c. q. lb.
Sunrise ...	1 2 1 10	Algerian ...	1 10 0 12
Belar	0 19 2 16	Kelsall's ...	1 5 2 21
Mulga ...	1 2 0 11	Lachlan ...	1 11 2 19

Farmers' Experiment Plots.

Winter Fodder Trials, 1927.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

The following farmers conducted winter fodder experiments in conjunction with the Department during the season:

Colin Shields, Somerset (Mount George Agricultural Bureau).
Alex. Smith, Bandon Grove (Bandon Grove Agricultural Bureau).
W. J. Smith, Bendolba (Bandon Grove Agricultural Bureau).
J. T. Muddle, Bandon Grove (Bandon Grove Agricultural Bureau).
W. J. Dowling, Bandon Grove (Bandon Grove Agricultural Bureau).
S. Ebbeck, Vacy (Vacy Agricultural Bureau).
R. Ebbeck, Vacy (Vacy Agricultural Bureau).
R. Richardson, Mondrook (Taree Estate Agricultural Bureau).
G. Levick, Taree Estate (Taree Estate Agricultural Bureau).
A. M. Singleton, Mondrook (Taree Estate Agricultural Bureau).
J. P. Mooney, Dumaresque Island (Dumaresque Island Agricultural Bureau).
B. Richardson, Dumaresque Island (Dumaresque Island Agricultural Bureau).
K. Brimstone, Dumaresque Island (Dumaresque Island Agricultural Bureau).
J. J. Milligan, Bulby (Bulby Agricultural Bureau).
G. A. Paterson, Krambach (Bulby Agricultural Bureau).
F. Waters, East Kempsey (East Kempsey Agricultural Bureau).
J. Nixon and Campbell, Nabiac (Nabiac Agricultural Bureau).
J. Booth, Temagog (Temagog Agricultural Bureau).
E. H. Ducat, Temagog (Temagog Agricultural Bureau).
John Richards, Bulahdelah (Bulahdelah Agricultural Bureau).
John Shiel, Kiah, Comboyne.
J. G. Allan, Orange Grove, Bowraville.
H. T. Wheeldon, Gladstone, Macleay River.
M. Smith, Bona Vista, Paterson.
A. Longworth, Ghinni, Manning River.
W. H. Abbott, Wingham, Manning River.
Alan Murray, Kolodong, Manning River.
A. C. McLeod, Mondrook, Manning River.

It will be noticed that the majority of the growers are members of branches of the Agricultural Bureau scattered throughout the district. That the winter fodder competitions conducted by these local bodies are to a large extent responsible for the keenness shown, there is little doubt. While it is obvious that in the Farmers' Experiment Plots quite a number of varieties are included purely for experimental purposes, making the plots quite unsuitable for a "champion fodder plot," still quite a number of farmers do make use of them for the purpose, as well as growing the mixtures recommended.

The Season.

The season was one of the most trying yet experienced on the Coast. First, floods at Easter, the highest on record in the Wallamba and Bulahdelah districts, completely spoilt the plots in these centres. At Bandon Grove, and other places, plots were submerged just after sowing, or else the seed-beds were so battered down that they could only be brought back to normal

after a considerable lapse of time and by much work. Then followed what was possibly the driest winter and spring on record, the drought not breaking until long past the time when rain would have been of use. In many places the rainfall did not exceed 3 inches over the whole growing period. Frosts, too, were most numerous. In places where, under average conditions, not more than a dozen would be recorded, from sixty to eighty occurred during the season. Little wonder, then, that under such adverse conditions there were so many failures.

Still, in the face of all, there were scattered here and there men who, by the soundest methods, were able to turn out plots equal or superior to many produced under the most favourable conditions, and I have no hesitation in saying that what was possible with these men could have been done by many others similarly placed. It is gratifying to state that of the dozen (and there was certainly not more than that number) "top-notch" plots seen on the Lower Coast, 75 per cent. were with Agricultural Bureau members and sown for the Winter Fodder Contest. To turn out a good field of fodder in a favourable season, when nature does most of the work, requires very little energy or knowledge, but it takes men of progressive ideas, backed up by any amount of enthusiasm, to produce a good show plot, combining yield, quality of fodder, and other necessary features, in a most unfavourable season, and it is a remunerative business, too, when it means the keeping up of the output from, and condition of, one's dairy herd.

The rainfall during the growing period at several centres was as follows :—

Month.	Kempsey.	Taree.	Dunbar Squire Island
	Points.	Points.	Points.
April	623	1,693	1,728
May	2	209	183
June	113	255	234
July	19	2	10
August	0	18	36
September...	67	80	85

At Gladstone the rainfall was less than at Kempsey from May to September, inclusive, and at Temagog much less than at Gladstone. Mount George did not receive more than 3 inches over the same period, while Bulby, Paterson, and Dungog received about the same as Mount George.

Comment.

Unfortunately, the ideals of fully 75 per cent. of fodder growers is to get the seed in. Cornstalks are turned under, mostly the seed is then sown (sometimes a harrowing or discing is given first) and then nature is supposed to do the rest, as it does do in most seasons; but these methods are useless in long, dry spells, as many have found to their sorrow this season.

It has been pointed out time and again that no farm is so small that at least 2 acres could not be got under the plough for winter fodder. Operations should commence about December, and then, with an additional ploughing or a discing or two, the field will be in a mellow condition for sowing in April. This preparation involves no great amount of work and is simple and effective. Where it is not possible to start cultural operations earlier, the fallow must of necessity be shorter. It is far preferable to delay sowing and utilise the time with workings (ploughings for preference) to obtain a mellow seed-bed. Better results will be got than by working insufficiently and sowing at an earlier, and possibly more seasonal, time.

The addition of superphosphate at 1 to 1½ cwt. per acre before sowing on well-worked lands gives a wonderful fillip to the crops, and ½ cwt. of nitrate of soda as a top-dressing helps to increase the yield and improve the quality. It must be borne in mind, however, that fertiliser should only be used to supplement good cultural methods, and not as a substitute.

Of late years, especially on the Lower North Coast, the combination, oats, wheat, peas and vetches, has come into favour with dairymen. The mixture is a well-balanced one. Wheat, being tougher in the stalk than oats, prevents the latter, to a large extent, from lodging in rough weather, and, further, it makes use of a different strata of soil without robbing, to any great extent, the area occupied by the oat root system. Both peas and vetches are included, because invariably one or the other fails, especially when used in this combination. About 1¼ bushels of oats (Sunrise, Mulga or Myall) plus ½ bushel of wheat (Gresley—this variety maturing about the same time), and ⅓ bushel of the legumes is a satisfactory mixture on the average class of soils. Florence and Clarendon wheat are still popular varieties. Owing to their earlier maturity, there is every reason to believe that the newer varieties of field peas—French Grey, Delano and Lima—will oust the Grey when seed becomes more plentiful.

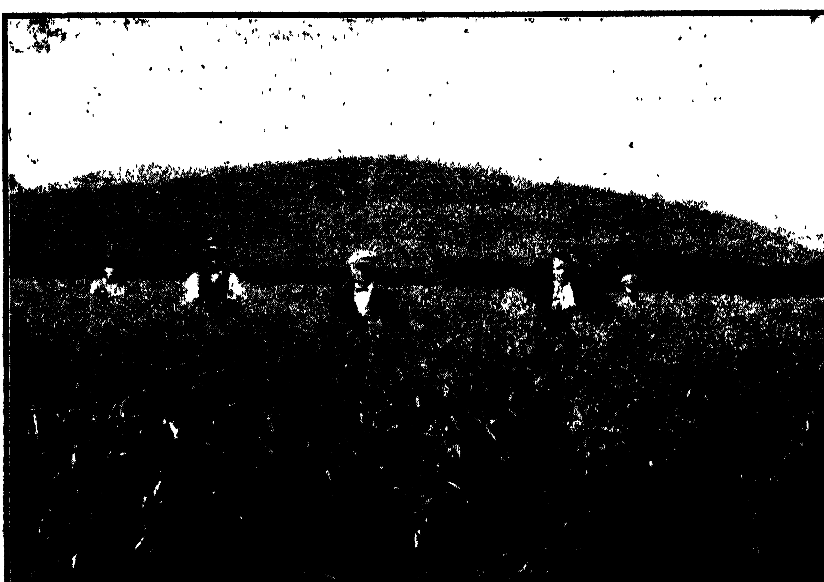
No crop has given greater promise as a grazing proposition than rye during the past two seasons. Sown in February, it can be grazed five or six times during the winter. On the Comboyne it was the only crop that grew during the drought. It comes early, does better than other crops on the weaker soils, and is a splendid milk producer. Black Winter was the variety used.

Cultural Details.

Comboyne.—Rather shallow, volcanic soil; practically new land. Previous crop, oats. Disc ploughed January, disc cultivated February, then tine harrowed. 1 cwt. superphosphate broadcasted prior to sowing. Seed covered with the tine harrow on 11th March, 1927. Heavy rain after germination; no other rain of use during growing season, and very cold. Soil loose and dries out quickly. Myall grew 2 feet; about 5 tons to the acre; Florence similar; remainder—Guyra, Clarendon and Trabut—very poor and no weights kept; necessary to feed off for cow feed prematurely. A crop of Black Winter rye and Berseem sown on better class volcanic soil on 16th

March and similarly cultivated gave very satisfactory results. It was fed off 1 foot high on 5th June; fed off 1 foot high 6th July; again at lesser heights in early August and on 12th September. It was surprising how the rye grew under such adverse conditions. It came all the time and proved itself a valuable grazing crop for the plateau.

Mount George.—Rich alluvial soil, cropped many years. First ploughing after maize in September; fallowed till December; ploughed again; disc harrowed several times; ploughed again in March and double disc harrowed. Sown after heavy rain 26th April; no fertiliser. These were excellent plots, considering that barely 1 inch of rain fell over three months mid-June to mid-September; less than 3 inches over wh le growing period.



Mulga Oats and Peas at C. Shields', Mount George.

The yield was 15 tons per acre on less than 3 inches of rain.

Bulahdelah.—Second-class poorish, shallow soil. Ploughed once, harrowed, &c.; sown early April. Completely spoilt by record April floods.

Bandon Grove (A. Smith).—Maize in 1925, fodders in 1926. Ploughed late September; disced and sown to cowpeas; poor growth owing to drought; grew better after December rain; rolled and disced. Deeply ploughed in February; rolled and disced again; disced several times after rain; springtoothed, rolled, and ploughed shallow late March; rolled and springtoothed again and sown 15th April with special fertiliser at 3½ bags on 2 acres with cereals; 1 cwt. superphosphate applied to the cowpea crop.

Flooded 18th April for some hours; only 80 points of rain recorded during remainder growing season. Ground dried hard after flooding; sixty frosts recorded. Crops excellent under most unfavourable conditions.

Vacy (S. Ebbeck).—Light loamy soil; cropped many years. Ploughed twice after summer crop; harrowed; sown 20th May. Rather late sowing, followed by cold, dry weather; soil dried out and barely 6 inches of growth resulted; fed off.

Montrook (R. Richardson).—Alluvial loam; cropped several years, maize and millet chiefly. Ploughed end of February, and again twice after April rains. Sown late May; germination good. Dry weather set in; very little early growth; came on better in spring, but w s patchy. The wheats were sown on adjoining land ploughed three times. They showed a marked difference in yield. Usually weighing about half that of the oats, they outyielded the latter considerably. The comparison with Wa lilla cannot be recognised, as it was on the portion not ploughed three times. Crops rusty.

Mondrook (A. C. McLeod).—Alluvial soil; cropped many years to maize and millet. Ploughed first week in March and twice disced; sown 16th to 18th April prior to rain; heavy rain following battered the soil hard. Vetches and peas did better here than in most places, probably owing to thinner germination of cereal crop.

Temagog (J. W. Booth).—Rich, light alluvial soil; cropped many years. Ploughed twice after maize crop. Rainfall after April rain was practically nil. Crop sown 13th May; fairly good growth of Mulga and Sunrise; others not worth weighing.

East Kempsey (F. Waters).—Medium heavy alluvial soil; cropped many years. Ploughed once after maize and sown in early May; dry conditions followed and, the plot being situated on low ground, very little growth took place. Crops had to be used prematurely for cattle fodder; probably averaged 5 or 6 tons per acre.

Dumaresque Island (B. Richardson).—Shallow, heavy soil; new land. Ploughed three times since new year; not possible, owing to damp conditions, to sow earlier than 31st May; very dry conditions followed and poor growth resulted. Farmer fed off owing to shortage of fodder. In a rye manurial experiment sown on similar soil which had been ploughed four or five times after last year's fodder crops, some excellent results were obtained, although no yields were recorded. The rye grew continuously throughout and was fed off several times; the fertilised plots were better in colour and class of fodder than the no-manure. Florence wheat and Trabut barley failed.

Dumaresque Island (J. P. Mooney).—Light alluvial soils; cropped for a number of years; previous crop, maize. Ploughed once and double disced, rolled and double harrowed. Very dry conditions. Sowing made too late—6th June. These plots were in marked contrast to those better worked and sown earlier for the Winter Fodder Competition.

Gladstone.—Light loamy soil; cultivated many years; previous crop, maize. Seed sown on 27th May after one ploughing; two harrowings were given. Germination was good; slightly more rain fell here than at Kempsey, though hardly 2 inches fell during the four months after sowing. Gresley, although not yielding the heaviest, was the best of the wheats.

Dumaresque Island (K. Brimstone).—Rich alluvial soil; cultivated for a number of years; not cropped since previous winter. A light dressing of twelve loads of farmyard manure applied and disced in before ploughing in November; ploughed again in January and March, followed each time by harrowings. Although ready for sowing, heavy rain spoilt the seed-bed, and a discing and harrowing were given. Sown 29th April, 1 cwt. superphosphate being applied before sowing, and ½ cwt. superphosphate plus

Wheat Grown on Rich Brush Soil—W. H. Abbott's, Wingham.
Note the difference between the area on the left (ploughed twice) and that on the right (ploughed once.) Yields—7½ tons and 3 tons, respectively.

28 lb. nitrate of soda in June. These were magnificent plots, and carried off the District Winter Fodder Championship, and provided an excellent illustration of unfavourable conditions being overcome by scientific farming methods. The Gresley wheat and Sunrise oats plus Gresley plots sown 27th May on a portion not nearly so well prepared were not weighed, but would not exceed 8 or 9 tons.

Temagog (E. H. Ducat).—Light alluvial loam; cropped for many years with maize chiefly. Stalks ploughed in after maize; germination was good, but continued dry, cold, frosty weather, and the light soil were responsible for very poor growth; crops were fed off.

Taree Estate (Geo. Levick).—Medium alluvial soil; previous crop, oats in 1926. Ploughed in December, harrowed and rolled; ploughed again in March and harrowed. Superphosphate spread over plot at the rate of 1 cwt.

per acre; sown 13th April. Germination weakened by wash from heavy rain shortly afterwards. These particulars refer to the plots in table of yields on page 302. Florence wheat and Mulga and Buddah oats were sown on another portion not ploughed until March, following cow-corn; ploughed again early in May and sown on 20th May. This plot failed and was fed off.

The oat plots were very nice, although a little rust was noticeable in August. There was a marked difference between the plots better cultivated and sown early and the poorly-worked plots sown later—the difference between success and failure.

Wingham.—Heavy brush country soil; has been under maize and other crops for many years. Portion ploughed twice extending equally across all plots; rolled and disced; seed disced in 24th May and harrowed. Germination good; good growth took place until the end of August, when the crop showed signs of withering. There was a remarkable difference between the end ploughed twice and that ploughed once, the yields being 2 to 1 in favour of the former, and the class of fodder very superior. All the crops did fairly well under most trying conditions.

Bulby.—Volcanic soil, medium depth; previously cropped to winter fodders, maize and sorghum. Ploughed twice beginning of March; sown early May. Very dry, frosty conditions followed; crop failed and fed off.

Krambach.—Low-lying, second-class country; previous crop winter fodders. Ploughed January; disc harrowed end of March and early April; rain followed; ploughed again first week in May, and disc-harrowed crosswise; seed-bed good; sown 13th to 16th May and harrowed; 130 lb. superphosphate per acre applied with seed. Dry conditions followed. This class of country requires plenty of rain. Crop fed off.

Bendolba.—Light alluvial soil; cropped for a number of years. Ploughed February and disc harrowed; ploughed again after April rains; cultivated and harrowed; sown late May. Too late for good results; crop not up to standard; no yields were kept, but would not exceed 6 or 7 tons per acre.

Kolodong.—Alluvial soil; cropped for a number of years. Ploughed once following maize, and worked down with harrows; sown first week in May. Dry conditions followed and the farmer estimates about eighty frosts; no growth made; fed off.

In a rye manurial trial sown on second-class land previously cropped with peas, and ploughed once and worked down, the crop was sown on 3rd April. Twenty inches of rain in one week fell shortly afterwards and battered the ground hard. The manured sections certainly looked greener than the unfertilised, but there was no growth—barely enough to feed off.

Vacy (R. Ebbeck).—Sandy loam; land previously cropped to maize sorghums and winter fodders. Ploughed after removal of stalks; harrowed, rolled; ploughed again after Easter rains and sown in May. Very dry conditions followed, and, being light soil, very little growth took place, the crop being fed off.

Paterson.—Loamy soil; previously cropped to maize, lucerne, and winter fodders for a number of years. Land ploughed twice early in the autumn; flooded at Easter; ploughed again and sown on 24th May. The oats failed; made little growth and were rusty.

Mondrook (A. M. Singleton).—Alluvial, loamy soil; cropped a number of years. Millet previous crop. Land ploughed once, and worked down, harrowed, rolled, &c. Sown 7th May; very dry conditions. Crop uneven and patchy. Sunrise grew to 18 inches; too uneven to weigh; crop fed off owing to shortage of fodder.

Ghinni.—Heavy loamy soil; ploughed over after maize, harrowed and rolled; sown 20th May; slow early growth; crop hungfire with dry winter; fed off when only about 12 to 18 inches high.

Nabiac.—Medium loamy soil; land cropped for a few years with maize and winter fodders. Ploughed early in autumn and again end of March. Sown early April; plot completely destroyed by floods.

Bandon Grove (J. T. Muddle.)—Heavy alluvial soil; paspalum paddock recently broken. Ploughed, disced numerous times, and worked to good tilth. Sown late May; dry conditions followed; crop made headway for a while, but eventually withered; mostly fed off.

Bandon Grove (W. J. Dowling).—Heavy alluvial soil; cropped for a few years. Ploughed twice after Easter rain; sown late May. Good seed-bed. Very poor growth resulted owing to dry conditions; crop fed off.

YIELDS in Winter Green Fodder Trials :—

	Tomago.	Gladstone.	Mondrook (R. Richardson).	Mondrook (A. C. McLeod).	Taree Estate (G. Levick).	Dumaresque Is. (J. P. Mooney).	Wingham.	Dumaresque Is. (K. Brimstone).	Mt. George.	Paterson.	Bandon Grove (Alex. Smith).
	t. c.	t. c.	t. c.	t. c.	t. c.	t c.	t. c.	t. c.	t. c.	t. c.	t. c.
Sunrise oats ..	12 14	8 15	6 8	8 15	16 11	10 4	12 0	...	17 11	...	12 0
Sunrise oats and peas	...	...	6 5	...	...	...	...	...	15 0	...	...
Sunrise oats and vetches	...	...	7 12	9 12	15 5	...	12 0	18 10	17 0	5 14	...
Sunrise oats, Gresley wheat, peas, and vetches	...	...	...	11 1	13 0	...	11 0	18 1	...	...	...
Sunrise oats, peas, vetches	...	...	11 17	...	...	...	...	...	...	...	...
Mulga oats	16 8	...	...	...	...	...	...	...	...	...	9 11
Mulga oats and vetches	...	...	5 14	...	14 0	...	...	...	...	...	...
Mulga oats and peas	...	...	6 1	...	...	...	...	...	15 0	...	...
Myall oats	...	...	...	7 4	...	...	10 0	...	14 0	...	...
Myall oats, Gresley wheat, peas, and vetches	...	...	...	7 14	...	...	...	...	...	...	13 14
Buddah oats ...	...	...	3 8	8 14	...	9 8	...	...	...	...	12 12
Belar oats	...	...	4 11	...	...	...	...	...	...	...	...
Florence wheat ...	...	...	7 4	...	...	9 19	7 0	...	18 7	5 1	8 4
Gresley wheat ...	...	9 15	9 10	...	...	10 4	...	...	13 17	4 17	...
Clarendon wheat ...	...	10 2	10 1	...	...	9 18	7 10	...	...	4 5	...
Canberra wheat ...	...	...	...	...	...	...	...	...	...	4 5	...
Wandilla wheat ...	...	...	3 0	...	...	...	...	...	...	...	...
Thew wheat ...	...	...	...	...	...	9 17	...	...	...	...	...
Trabut barley ...	...	11 0	...	4 0	...	...	6 0	...	...	...	...

General Behaviour of Varieties.

On the year's performances there was very little to choose between Sunrise, Mulga, and Myall, all behaving well where the best cultural methods were used. Buddah did well at Tinonee. Belar and Algerian were too late, and are not of much use for coastal fodder.

Gresley has come into favour as a useful wheat, either alone or in combination. Clarendon and Florence are still the best of the others. Barleys practically failed everywhere. The tares and field peas in the combination plots also did poorly. When sown in this manner they require more rain.

Field Pea Variety Trials.

The following farmers conducted experiments with the newer varieties :—

Alex. Smith, Bandon Grove.
S. Ebbech, Vacy.
M. Smith, Paterson.
L. Northcott, Taree Estate.
D. Dornan, East Frederickton.
E. H. Ducat, Temagog.

The varieties tried were Dun, Delano, Canada, Lima, French Grey, Grey, Blue, Black Eye.

At Bandon Grove the old Grey is usually grown. This variety produces a great bulk of fodder, but it comes too late mostly for inclusion in combination plots. Delano, French Grey, and Lima were the most promising here. Lima and French Grey matured much earlier than the old Grey, and, with Delano, gave a great bulk of green fodder.

At Paterson the variety largely grown in the Hunter District—Black Eye—came moderately early (certainly much earlier than French Grey) and gave a great bulk. Mr. Smith considers it still without equal. However, it is very little superior to Lima and French Grey.

Some excellent plots were grown with Mr. Northcott, Taree Estate. The following notes were recorded :—

French Grey.—A great bulk of foliage. Remains green for a considerable time, and, owing to its upright habit of growth, keeps greener closer to the ground. Very suitable for mixing with cereal crops; earlier than Grey.

Black Eye.—Much earlier than French Grey; grows great bulk of foliage, but inclined to hang to the ground, which causes lower leaves to become yellow and to decay.

Lima.—Earlier than French Grey; good bulk of fodder; not quite as upright nor as leafy as French Grey.

Blue.—Slow starter; fair bulk of fodder; not as good as any of the above.

Delano.—Shade later than French Grey; great bulk of fodder; upright grower; keeps green to the ground; a good sort.

Dun.—Largely grown on the Macleay. It comes early, but is a procumbent grower; the growth is softer than the other varieties, and there is more "rot" in the undergrowth.

Canada.—This was the earliest variety, but there was not nearly the quantity of growth compared to the abovementioned sorts.

Grey.—The latest maturer; very heavy and dense growth, but not any more so than Delano or French Grey.

At the farms of Messrs. Dornan and Ducat the plots were sown rather too late for best results and, being caught by the very dry conditions, they did not do too well.

THE SOUTH COAST.

R. N. MAKIN, Senior Agricultural Instructor.

Experiments were conducted on the South Coast with varieties of wheat and oats suitable for green fodder, chiefly for dairy cattle, during the season. The following co-operated with the Department in the work :—

A. C. Brown, Exeter.
E. Mathie, Albion Park.
J. W. Childs, Camden.
V. J. Collins, Bemboka.
Roy Garrad, Milton.
H. F. Sawtell, Cobargo.
J. R. Knapp, Bolong.
Lindsay Evans, Dapto.
A. Chittick, Kangaroo Valley.

The weather conditions were anything but favourable for good yields, as a very dry spell was experienced early in the year, which prevented the preparation of the ground at the right time for the March sowing that is necessary for the production of early green fodder. The failure of most of the plots was due not only to this fact, but also to faulty drainage on soils which, under ordinary conditions, produce good crops. The extraordinary rain which fell in April was too much for the ploughed ground in some places, and failures were recorded at Camden, Bolong, Exeter, Cobargo, and Bemboka. When some useful rain fell in the early spring months, after a very dry spell during the winter, some plots made fair growth, and the results are recorded below, but others made poor growth and were fed off by stock.

Details of the Plots.

Milton.—Soil red loam of basalt formation; well drained; ploughed with mouldboard, 6 inches deep; seed sown, 2 bushels; superphosphate, 1 cwt.; harrowed in on 17th March; total rainfall during growth, 3,396 points, of which 2,117 points fell in April.

Kangaroo Valley.—Soil, sandy loam, well drained; ploughed with mouldboard, 6 inches deep; seed sown broadcast, 2 bushels; superphosphate, 1 cwt.; harrowed in 17th March; total rainfall covering period of growth, 2,861 points, of which 20 inches fell in April.

Dapto.—Soil, light loam, formed from basalt, well-drained; ploughed with mouldboard, 6 inches deep; seed, 2 bushels; superphosphate, 1 cwt.; sown broadcast, and harrowed in 19th May, the ground being in good condition; total rainfall not available, but that recorded from time of sowing to heading out of varieties was only 232 points.

Albion Park.—Soil, light loam from sandstone formation; drainage good; ploughed with mouldboard, 6 inches deep; seed at rate of 2 bushels; superphosphate, 1 cwt., sown broadcast and harrowed in 9th May; total rainfall covering period of growth, 2,161 points, of which 1,931 points fell in April. This plot made a great recovery in the early spring, when some useful rain fell.

TABLE of Yields.

	Dapto.		Milton		Kangaroo Valley.		Albion Park.	
	Yield.	Date of Harvesting	Yield.	Date of Harvesting	Yield.	Date of Harvesting.	Yield.	Date of Harvesting.
	t. c.		t. c.		t. c.		t. c.	
Wheat—								
Florence... ...	7 0	18 Oct.	3 5	27 June	3 0	24 July	8 9	12 Oct.
Firbank	7 10	18 „	4 15	2 July	4 0	24 „	7 6	12 Sept.
Gresley	7 6	18 „	6 0	22 June	2 13	24 „	7 1	22 „
Oats—								
Kelsall's ..	11 13	18 „	6 2	25 „	4 14	25 Aug.	9 15	15 „
Guyra	12 6	18 „	8 16	22 Aug.	6 8	25 „	16 18	14 Oct.
Buddah	9 16	18 „	12 0	23 July	6 10	25 „	17 1	22 Sept.
Myall	9 3	18 „	9 8	4 Aug.	4 7	25 „	14 10	1 Oct.
Mulga	9 16	18 „	10 15	10 „	4 5	25 „	15 19	26 Sept.
Sunrise	12 8	18 „	14 5	17 „	4 14	25 „	16 6	14 Oct.
Algerian ...	12 6	18 „	8 5	24 Sept.	4 4	25 „	16 6	14 „

Comments.

The season was such a bad one that it is impossible to glean much information from the above returns. The crops were all healthy as far as rust was concerned, except Kelsall's oats, which, at Milton and Albion Park, showed evidence of that trouble. It is not likely to prove a suitable oat for coastal conditions owing to its liability to rust. Buddah will probably prove a much better variety, although not quite so early. Buddah has now stood the test of two seasons, and is shaping well. Although it may not yield quite the bulk of greenstuff that Sunrise usually produces, it will outdo that variety by weeks in early maturity, a feature which some dairy-farmers appreciate. As there is more seed available this season than in previous years, it will be tried more extensively than formerly. It may also prove a much better variety for grazing purposes than Sunrise.

For the coming season varieties that should be planted for green feed are Buddah, Mulga, Sunrise, and Algerian; and for grazing Buddah, Mulga, and Algerian.

The Wheat Root Grub.

(*Anodontonyx tetricus.*)

T. McCARTHY, Senior Assistant Entomologist.

THE first definite injury to wheat by the larvae of the Wheat Root Beetle (*Anodontonyx tetricus*) was recorded in 1925, when white curl grubs were reported to be attacking young wheat in the Tamworth and Billimari districts. Adult beetles bred for the first time from these infestations were later identified by Mr A. M. Lea as *Anodontonyx tetricus*. Prior to this the only record was a statement in the *Agricultural Gazette of New South Wales*, vol. 33. p. 558, 1922, that white grubs were attacking wheat in the Riverina. The identity of the species was not disclosed, however, and there seems but little doubt that the same species was responsible. Occasional unauthenticated statements have also been made that white grubs were found in wheat over thirty years ago.

The adult beetle was first recorded from Australia in 1907 by the Rev. T. Blackburn in the "Transactions and Proceedings of the Royal Society of South Australia," vol. 31, p. 261, being described as new under the name of *Anodontonyx tetricus* from specimens obtained at Bathurst and Jenolan Caves. There are specimens, however, in the Entomological Branch, bearing the date of collection 1902.

It is clear, therefore, that the insect is a native species which was first recorded as a definite pest of wheat in 1925, and that its status as a pest prior to that year was apparently not of sufficient importance to warrant it being reported. During the past three seasons it has been reported frequently from a number of districts including Tamworth, Barraba, Billimari, Grenfell, Murrumburrah, Old Junee, and Narrandera. The available evidence would therefore indicate that the occurrence of the insect as a pest is comparatively recent, and that some factor has influenced its appearance in wheat crops. In this, the practice of fallowing, which of late years has come into more general use seems to have played some part. This is based upon the observation that the beetles show a decided preference for freshly turned soil when they are returning to the soil late in the afternoon. It has also been observed that soil worked some weeks prior to the appearance of the beetles, or land free from natural growth, is more attractive than stubble or grassed land.

Nature of the Injury.

Wheat and oats are the only economic plants attacked by this pest. In all the infestations noted the injury has invariably occurred in red soils. Grubs have been found in white or light grey soils, but never in sufficient numbers to cause any noticeable injury. Wheat growing in black soils has never been found to be infested.

The presence of grubs in a crop is first manifested by the poor growth of the wheat in patches, in contrast to uninfested and normally growing portions. As the injury increases these patches become more noticeable, until finally the young plants die, and bare patches appear in the crop in a similar manner to that produced by the disease known as "take-all," with which the injury is sometimes confused.

The injury to the young wheat is caused by the larvae feeding on the young r oots and gradually cutting them off to the stem. As the roots are de troyed the plant endeavours to produce fresh roots, but these in turn are destroyed and the young plant eventually withers and dies. In some cases when all the roots are destroyed the grubs continue to feed upon the stem, and gradually pull the plant below the surface. The extent of the damage is always greater when the crop lacks its normal vigorous growth. Thus in crops affected by drought the damage is correspondingly greater than where the growth is vigorous.

This was demonstrated in the Tamworth and Murrumburrah districts during the past season. The former district suffered rather severely from the drought, and the areas infested by "grubs" were considerably damaged. In the Murrumburrah district a crop of 65 acres was equally infested with grubs, but owing to its vigorous growth it was able to outgrow the attack and the final loss was estimated at about 7 per cent. Earlier in the season it appeared from the large number of grubs present that the loss would be as high as 30 per cent.

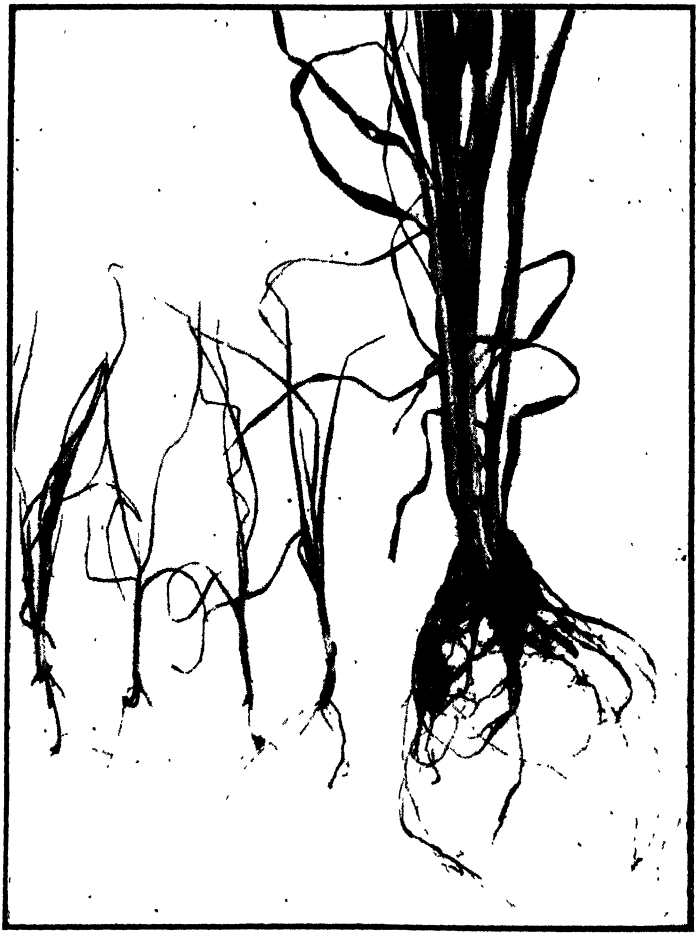
In all cases the injury has been of a scattered character; one paddock may be considerably damaged and the adjoining ones may be almost free from attack. The pest may also manifest itself in one portion of a district and be entirely absent from the remaining parts.

Life History and Habits.

The adult beetles appear in the field in their greatest numbers between 25th November and 15th December. A limited number of beetles emerge as late as January, and these are responsible for the smaller grubs often found in the field when the majority of the larvae have become full grown. The incidence of the adult beetles in the field varies from day to day. One day they may be particularly numerous and the following day much less so. This seems to depend upon the temperature and sunshine, while the beetles were observed to be particularly numerous on days immmediately following rain. The first beetles were observed to appear each day about 2 p.m., but it was not until 3 p.m. that they became numerous. They can then be seen congregating on any object in the field, and are very numerous on fence posts, thistles, ears of wheat, &c. On isolated box trees (*Eucalyptus melliodora*) in the cultivation paddocks they were observed to be very numerous.

Between the hours of 3 p.m. and 5 p.m. the beetles are most abundant and a continual hum, similar to that produced by bees, is noticeable. When thus abundant the beetles cause considerable annoyance to men and horses

in the field, and in some instances have caused harvesting operations to be temporarily suspended. The majority of the beetles return to the soil between 5 p.m. and 5·30 p.m., only odd specimens being observed after that time. The beetles were most active on bright sunny days. In the presence of wind and limited sunshine they remain more or less stationary. They are capable



The Damage done by the Wheat Root Grub.

Plants from infected and non-infected portions of the same crop. The upper portion of the hea'thy plant has been omitted.

of making long flights, but are usually content to make short rapid flights to and from the objects on which they are congregating, or to crawl rapidly about, frequently becoming bunched.

The factor which causes them to become active at a regular hour each day appears to be the gradual increase of the soil temperature as the day progresses. Observations at daybreak revealed the beetles at a depth of from 2 to 6 inches,

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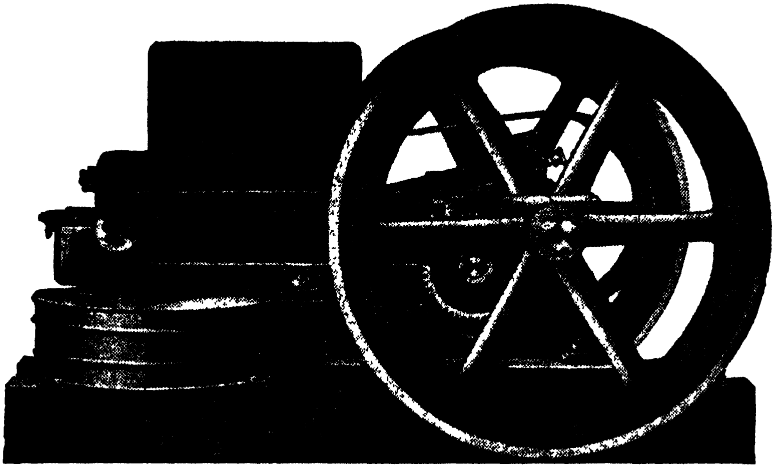

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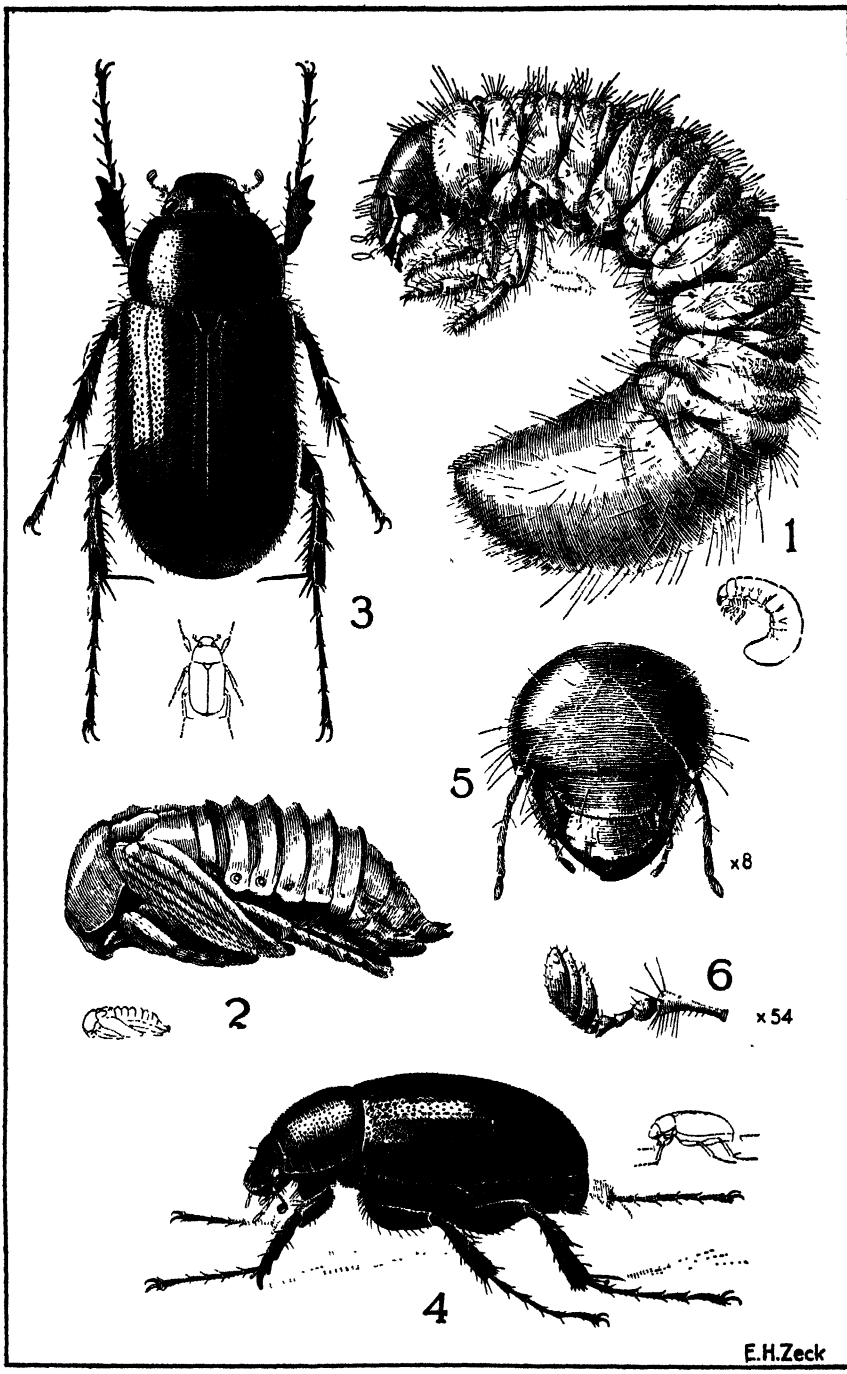
with the soil relatively cold and the beetles in a somewhat torpid condition. As the day advanced the temperature increased and the beetles nearest the surface were noticed to be more active when disturbed. The beetles have never been observed to feed above the ground, and emerge apparently to copulate. Copulation occupies about ten seconds, and not the lengthy period which occurs in some other and larger Melolonthinae. After mating the body of the female becomes gradually distended by the development of the eggs, and is noticeably enlarged by the time she commences to lay her eggs.

No eggs were found in the field, chiefly because of lack of facilities for examining quantities of soil. In the laboratory the eggs were laid in clusters 2 to 4 inches below the surface in cavities made by the female. Dissection of ten females in the laboratory showed sixty-six to be the highest number of fully developed eggs in a single female. In the laboratory about ten days elapsed before the beetles were ready to lay eggs, and as the life of the adult is short this indicates that in the field the majority of the eggs are laid during the first fortnight in December.

By far the greater part of the life cycle is passed in the larval stage, which is approximately ten months in duration. In its early stages of growth the grubs feed upon the roots of weeds and grasses, and upon decaying organic matter in the soil, and there is evidence that they can entirely subsist upon the latter. They are, however, about two-thirds grown when they first attack the young wheat, soon after it germinates in April and May, and the damage becomes definitely apparent as early as July and August by the presence of thin or bare patches in the crop. During the day the larvae are found at an average depth of two inches below the surface, but there is evidence that the grubs approach the surface sufficiently close at night to disturb it, and observations in the laboratory indicate that feeding chiefly occurs during that period. Grubs are usually present throughout the entire crop in limited numbers, but may be very numerous in patches, as many as forty to the square foot being record d. By the middle of October the grubs become full grown and construct earthen cells, the internal surface of which is finely packed and almost smooth. The cell is usually constructed from four to six inches below the surface in the more consolidated soil. In the cell thus constructed the grubs first assume the pro-pupal condition, during which the colour becomes pure white; later they change to the pupal stage. When the adults first change from the pupa they are reddish-brown, but remain within the pupal cell until they assume their normal black colour. The duration of the pupal stages is about six weeks, and the complete life cycle about one year.

The Stages of the Insect.

For those not familiar with the life history of an insect it might be stated that the life of the Wheat Root Grub consists of four stages—egg, larva (grub) pupa, and adult.



The Wheat Root Grub, *Anodontonyx tetricus*; Family Scarabaeidae.
1—Larva; 2—Pupa; 3 and 4—Adults; 5—Head of larvae; 6—Antenna.

The Egg.—The egg is almost spherical in shape, with its longer axis about 1·85 m.m. (about one-twelfth of an inch) and its shorter axis about 1·57 m.m. (one-sixteenth inch) in length. In general colour it is yellowish-brown, but under the microscope its surface is seen to be covered with a fine network enclosing brown areas varying considerably in size and shape.

The Larva.—The larva is a fleshy curved grub about 21 m.m. in length (nearly an inch) when the body is straightened, and 5 m.m. (one-fifth inch) in width at the eighth abdominal segment where the body is thickest. The body is yellowish-white in colour, but the presence of dirt in the alimentary tract shows through the skin of the last few abdominal segments and gives them a black appearance. The legs are slightly darker yellow than the body, but the head and spiracles, which are small, are yellowish-brown, and the tips of the mandibles black. The body is sparsely covered with yellowish brown hairs, and the upper surfaces of the abdominal segments (two to seven), bear several irregular rows of short brown spines. The ventral surface of the last abdominal segment bears two patches of long spines hooked at the tips, and two rows of shorter spines which diverge outwards towards the extremity. The character of these spines on the ventral surface of the last abdominal segments appear to afford the best means of distinguishing the larvae of the various species known to the writer.

The Pupa.—The pupa is light yellow, 11 m.m. (about half an inch) long and 5 m.m. (about one-fifth inch) wide, with legs, wings, and other outlines of the future beetle plainly visible. Hairs and spines are absent, but the upper surfaces of the abdominal segments (one to six) are acutely ridged. The spiracles on the first four abdominal segments are large, prominently raised, and dark brown in colour. The remainder are inconspicuous.

The Adult.—The adult is a comparatively small beetle, 10 m.m. (about two-fifths inch) long and 5 m.m. (about one-fifth inch) wide. The general colour is black, slightly shiny, and finely pitted on both the upper and under surfaces. The antennae, palpi, and part of the legs are dark reddish-brown. The elytra (wing covers) are black, finely pitted, and furnished with four lines or ridges. They are more or less truncate at the tips, leaving the terminal segment of the abdomen exposed. There is no ready method of distinguishing the sexes, although the male is generally smaller than the female. A complete description of the adult can be found in the "Transactions and Proceedings of the Royal Society of South Australia," vol. 31, p. 261.

The adults appear in swarms in the field about harvest time, during November and December, clustering on fence posts and various other obstacles.

Control.

The problem of the control of subterranean insects such as white curl grubs has long been recognised by entomologists throughout the world as one presenting the greatest difficulty. It is not therefore easy to suggest satisfactory practicable methods for killing or controlling the grubs of the species under discussion.

Experimental work carried out at Tamworth with substances such as calcium cyanide (dust), calcium cyanide (granular), paradichloro-benzene, chlorocide, and naphthaline, used as soil fumigants, and with paris green and bran as a poison bait, proved unsatisfactory for large scale control in wheat fields. Calcium cyanide (dust), however, gave a 70 per cent. kill when applied heavily by hand at the rate of 30 oz. in small experimental areas of 100 square feet, but when applied at the much reduced and payable rate of 20 lb. per acre through the manure hopper of a seed drill it was not effective in killing the grubs. Cultivation of the soil to break up the pupal cells and break up the pupæ within has also been tested, and although numbers of the pupæ were injured by this means the numbers of beetles subsequently emerging proved this method to be of very limited value. Rotation of crops, which is recommended in some countries for the control of white grubs, is generally impracticable in our areas where wheat and oats are grown. Destruction of the adult beetle has also presented unusual difficulties owing to the limited time spent above the ground by the beetles, and the fact that the beetles do not feed during that period. Consequently the use of bright lights to attract and trap the beetles, or the poisoning of them with arsenicals is out of the question.

I was, therefore, forced to investigate in other directions for control. The most promising of these directions was to test the attractiveness of various substances for the adult beetles. The following substances were tested at Billimari in December, 1927 :—

Oleum menth.	Oleic acid.	Oil of geranium.
Oleum sassafras.	Butyric acid.	Whale oil.
Oleum anisi.	Oleum citronella.	Tinc. asafœtida.
Oleum picis.	Oil of myrbane.	Ess. amydg.
Oleum fœniculi.	Oil of cloves.	Amyl. acetate.
Oleum pini sylvestri.	Oil of carui.	Guaicol.
Oleum cassia.	Oil of turpentine.	
Oleum wintergreen.	Oil of eucalyptus.	

The results were interesting and suggestive. Of the substances used, guaicol, oleum wintergreen, butyric acid, and whale oil gave promise as attractants, their degree of attraction being indicated in the order in which they are mentioned. Guaicol was the outstanding attractant, and the result obtained with this substance at least warrants further and more extensive field tests when the beetles next appear.

Natural Enemies.

The common magpie (*Gymnorhina tibicen*) is easily the most important natural enemy of the Wheat Root Grub. It has been observed in numbers wherever infestations occurred, picking out the grubs and doing particularly good work should the soil be freshly turned. Referring to the work of the magpies, Mr. G. Gross, of West Tamworth, states that in one instance the ground appeared as if almost scarified by the magpies. Starlings (*Sturnus vulgaris*) have also been observed feeding upon the grubs. Ants occasionally

prey upon the adult beetles, and the large Robber Fly (*Blepharotes coriareus*) has also been seen feeding upon the beetles. No internal parasites have been bred.

In concluding this preliminary statement, I would like to express my appreciation of the assistance rendered by the following farmers:—Messrs. G. Cross, Goddard, and McRitchie, of West Tamworth, Mr. E. Larsen, of Billimari, Mr. N. D. Rae, of Grenfell, and Mr. W. J. Coddington, of Murrumburrah.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1927:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits ...	257,897	110,771
,, Tomatoes..	185,003	...
	doz.	doz.
,, Melons ...	...	20
	lb.	lb.
Canned Fruits ..	32,844	1,008
Dried Fruits—		
Unspecified ...	18,172	560
Currants ..	9,352	336
Raisins ..	9,604	224
Sultanas ...	...	84
Apricots ...	3,108	...
Apples ...	4,032	...
Peaches ..	2,604	28
Pears	1,736	...
Prunes ...	3,248	224

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	131
Bananas ...	....	1,167	...
Lemons ...	....	...	423
Oranges ...	....	...	11,980
Pears	....	...	27
Pineapples ...	....	...	557
Other	....	845	2,927
Dried Fruits—		lb.	lb.
Apples, Pears,	South Africa ...	3,750	...
Peaches, etc.	U.S.A.	279,694	...
Apples ...	....	...	200
Apricots ...	....	...	416
Currants .	....	...	7,340
Prunes ...	France	1,152	843
	United Kingdom	16	...
	U.S.A.	419,289	...
Peaches ...	....	...	460
Raisins—			
Sultanas ...	....	...	12,920
Lexias ...	....	..	56
Other ...	....	50,061	696
Dates	Mesopotamia ...	3,179,453	15,015
	Asia Minor ...	383,210	...
	France	8,572	...
	Turkey	31,080	...
Other—			...
	Asia Minor ...	159,109	1,606
	China	19,967	...
	France	240	...
	Greece	5,040	...
	Malaya (British)	390	...
	Spain	1,166	...
	Syria	1,137	...
	Turkey	28,656	...
	United Kingdom	230	...
	U.S.A ...	78,474	...
Preserved in liquor—			
Apricots ...	....	...	33,033
Peaches ...	....	...	38,587
Pears ..	....	...	3,137
Pineapples ...	....	...	1,162
Other ...	....	...	14,103

The Grade Herd Testing Movement.

Some Results of Three Seasons' Work.*

L. T. MacINNES, Dairy Expert.*

The testing of grade dairy herds has been going on in New South Wales for several years, and it is interesting to enquire if anything is to be learned by comparison of the figures one year with another. At the time of writing this paper it has not been possible to analyse the figures for the year ended 30th June, 1927, but those for the three years preceding are distinctly interesting, and present lessons of importance to every dairy farmer. They particularly direct attention to the value of the knowledge obtained by individual testing of the herd in connection with herd improvement, for analysis of the figures strongly suggests that culling has been going on to advantage as a result of the information afforded by the tester, and also that herds are being built up along selection and breeding lines. The figures, too, direct attention to the need for the provision of regular supplies of feed from season to season, and, therefore, to the need for better farming and pasturing methods with a view to the production of greater quantities of feed from the soil.

The first table compares the butter-fat yields of all the grade herds tested by the Department of Agriculture for the years named.

Butter-fat Yields—Grade Herds Tested, Years 1923–24, 1924–25, and 1925–26.

Yield.	Cows Tested.	Herds.	Under 105 lb. fat.		105 to 150 lb. fat.		151 to 200 lb. fat.		201 to 300 lb. fat.		Over 300 lb.		Average Yields.	
													Milk.	Fat.
	No.	No.	No.	%	No	%	No.	%	No	%	No	%	lb.	lb.
1923–24 (drought season).	5,610	105	2,361	42	1,865	33	1,110	20	272	5	2	...	2,640	111·4
1924–25 (excellent season).	10,982	198	2,501	23	2,782	25½	3,095	29	2,428	22	176	1½	3,381	151·1
1925–26 (good season).	22,229	455	4,720	21	5,646	25½	6,157	28	5,064	22½	642	3	3,707	159·5

It will be seen from the above table that, apart from the fluctuations in the seasons, the average yields of milk and fat are increasing, and the percentage of low-producing cows in the herds is decreasing, brought about principally by culling them out for butcher's beef. The effect of using a better class of sire, as many are now doing, is not apparent in the above records, because sufficient time had not elapsed for the heifers to be tested; but that form of uplift should be more in evidence in the records of subsequent years' testing.

The effect of feeding becomes apparent when we compare the yields of 1923–24 (a drought year) with those of 1924–25 (when the dairying districts experienced the best pasture growing year on record), and 1925–26 (when

* Notes of an address delivered at the Agricultural Bureau Conference at Singleton, 3rd February, 1927.

seasonal conditions were midway between those experienced in the two immediately preceding years). The average production of the tested herds for 1925–26 showed marked improvement over that of the previous year, when feed was in abundance throughout. This proves again the stimulating force of herd testing. Knowing the low producers, the farmers can cull them from the herd, thus obtaining for the balance more attention and a bigger share of the feed available, and nullifying the effects of the worse season. The average milk yields in 1925–26 throughout the herds tested increased by 426 lb. milk and 8·4 lb. fat over those of the 1924–25 year, in spite of the fact that the feeding conditions were not so favourable.

Taking 200 lb. of butter-fat as a payable standard on which to judge dairy cows, 95 per cent. of a total of 5,610 tested in 1923–24 did not attain that yield. In 1924–25, 10,982 cows were recorded, including the majority of those tested in the previous year, and the percentage below the standard of 200 lb. was reduced to 76½. Feed here had been the main factor, the same marked difference in production being shown in all untested herds, as was demonstrated by the outputs of the butter and cheese factories for the two years :—

1923–24 (drought season)—butter produced ...	35,000 tons.
1924–25 (excellent season)—butter produced ...	52,000 „
1925–26 (good season)—butter produced ...	47,000 „

For the year 1925–26, 22,229 cows were recorded, and 74½ per cent. failed to exceed the production standard of 200 lb. fat. Putting the same information another way :—

In 1923–24,	5	per cent. of cows tested exceeded	200 lb. fat.
„ 1924–25,	23½	„	„
„ 1925–26,	25½	„	„

As the numbers of cows and herds recorded doubled each year the improvement was the more significant. For the year 1925–26 there were twenty-three testing sub-units in operation, recording 455 herds, with 22,229 cows.

The table on page 316 analyses the yields of the cows in each unit. In all cases the whole of the cows passed through the milking yards and submitted to test are taken into the calculations, irrespective of the number of months they were milked.

From this table it is apparent that the percentage of cows tested which exceeded 200 lb. butter-fat in each district was as follows :—

Tweed-Richmond	25 per cent.
Dorrigo	39 „
Middle Rivers	24 „
Hunter River Valley	16 „
Tumut	31 „
Irrigation Area (Leeton)	51 „

TABLE Grouping Results in Each Testing Unit, 1925–26.

Sub-unit.	Yields in Butter-fat. Under 105 lb.	105 to 150 lb.	151 to 200 lb.	201 to 300 lb.	Over 300 lb.	No. of Herds.	No. of Cows.	Average Yield per cow. Milk.	Fat.
			Tweed-Richmond District.					lb.	lb.
1	160	278	456	398	28	22	1,320	4,031	173·1
2	184	376	400	267	11	23	1,238	3,449	157·7
3	188	311	384	248	4	20	1,135	3,627	155·7
4	153	310	437	313	21	23	1,234	3,812	167·4
5	243	251	218	131	7	15	850	3,350	140·6
6	395	359	238	61	...	22	1,053	2,992	121·6
7	339	353	217	61	...	22	970	3,086	128·8
8	344	397	346	156	13	22	1,256	3,446	140·0
9	186	136	249	542	99	23	1,212	4,646	192·2
10	209	300	309	99	...	17	917	3,351	140·8
11	82	98	221	452	109	20	962	4,620	212·1
Total ...	2,483	3,169	3,475	2,728	292	...	12,147	...	...
Percentage ...	20½	26	28½	22½	2½	...	...	...	...
			Dorrigo District.						
1	168	164	249	324	40	21	945	3,966	175·3
Percentage ...	18	17	26	34½	4½	...	...	...	...
			Middle North Coast District.						
1	164	184	241	241	34	23	864	4,055	169·1
2	114	153	245	292	26	21	830	4,467	181·1
3	197	309	282	127	8	23	923	3,411	146·2
4	71	109	174	164	36	14	554	4,429	179·8
5	129	173	230	304	64	25	900	4,106	190·1
6	202	289	372	211	9	20	1,083	3,478	155·3
7	347	273	100	6	...	15	726	2,539	107·3
8	183	261	242	83	1	15	770	3,107	141·0
Total	1,407	1,751	1,886	1,428	178	1	6,650	...	...
Percentage ...	21	26½	28½	21½	2½	...	...	...	...
			Hunter River Valley District.						
1	418	336	299	195	8	16	1,256	3,383	136·4
Percentage ...	33	27	24	15	1	...	...	...	...
			Tumut District.						
1	106	139	148	147	29	11	569	4,041	168·1
Percentage ...	19	24	26	26	5	...	...	...	...
			Murrumbidgee Irrigation Area.						
1	138	87	100	242	95	22	662	4,449	193·6
Percentage ...	21	13	15	36½	14½	...	...	...	...

Apart from the action taken by farmers in regard to culling and breeding as a result of the records obtained in this and previous years, the percentages of cows exceeding 200 lb. fat again demonstrate the part that feeding plays in the yields of our dairy stock.

The Hunter Valley, which showed up worst with only 16 per cent. exceeding 200 lb. butter-fat, experienced the worst feeding conditions for its herds. On the Irrigation Area all cows were hand fed during the greater part of the year on green fodder grown on the various farms. The recorded yields give point to the result, 51 per cent. exceeding 200 lb. fat.

ANALYSES of Herd Yields compared.

<table>
<tr><th rowspan="2">Yields.</th><th colspan="3">Percentage of Cows Tested.</th></tr>
<tr><th>1923–24.</th><th>1924–25.</th><th>1925–26.</th></tr>
<tr><td colspan="4">Tweed-Richmond District.</td></tr>
<tr><td></td><td>Per cent.</td><td>Per cent.</td><td>Per cent.</td></tr>
<tr><td>Under 105 lb. fat ...</td><td>42</td><td>23</td><td>20·5</td></tr>
<tr><td>105–150 lb. fat ... ...</td><td>33</td><td>26</td><td>26·0</td></tr>
<tr><td>151–200 " ... ...</td><td>20</td><td>29</td><td>28·5</td></tr>
<tr><td>201–300 " ... ...</td><td rowspan="2">5</td><td rowspan="2">22</td><td>22·5</td></tr>
<tr><td>Over 300 " ... ...</td><td>2·5</td></tr>
<tr><td colspan="4">Murrumbidgee Irrigation Area.</td></tr>
<tr><td>Under 105 lb. fat... ...</td><td>No records</td><td>19</td><td>21</td></tr>
<tr><td>105–150 lb. fat ... ...</td><td>"</td><td>15</td><td>13</td></tr>
<tr><td>151–200 " ... ...</td><td>"</td><td>22</td><td>15</td></tr>
<tr><td>201–300 " ... ...</td><td>"</td><td>35</td><td>36·5</td></tr>
<tr><td>Over 300 " ... ...</td><td>"</td><td>9</td><td>14·5</td></tr>
</table>

Here, again, there is proof positive of an uplift in herd averages. In the case of the Tweed-Richmond District the cows are mostly dependent on pastures for feed, and, therefore, the varying seasons are a big factor in production; from a pasture and fodder growing point of view the year 1925–26 was much inferior to 1924–25, yet the foregoing analysis shows the average per cow to have been greater in 1925–26, the percentage of inferior animals having decreased, and that of higher producers increased.

On the Murrumbidgee Irrigation Area the cattle are independent to a great extent of the rainfall, their fodder being grown under irrigation conditions. Here, again, the percentages are encouraging; cows yielding over 300 lb. fat have increased by 5½ per cent., and those yielding between 201 and 300 lb. fat an increase of 1½ per cent., making 7 per cent. increase in those yielding over 200 lb. fat. The increase in those yielding below 105 lb. butter-fat is accounted for by the large number of heifers coming forward in the last half of the testing year. Testing was not carried out on the area prior to 1924–25.

Production of Tested v. Untested Cows in 1925-26.

Some 750,000 cows were milked in New South Wales during the year 1925-26, the product of 80 per cent. of which (600,000) was utilised for butter-making. Of these latter number, 22,229 were the property of members of herd testing units, and their production records showed an average increase compared with the previous year of about 8½ lb. butter-fat each, equal to, say, 10 lb. of commercial butter. The total increased yields of these cows, therefore, came to 222,200 lb. butter, or nearly 100 tons.

The total output of butter in New South Wales for 1925–26, however, was some 5,000 tons less than that of 1924–25. Therefore, the total yields of the 577,000 cows in those herds that were not tested as compared with their yields in 1924–25 must have decreased by that amount plus the 100 tons increase given by the tested herds.

A falling off in production of 5,100 tons of butter divided amongst these 577,000 unrecorded cows gives them an average decreased production of about 20 lb. butter each, making the aggregate difference per cow in average butter production between the tested and untested herds 30 lb. for that year.

Cash Value of the Increase.

Farmers who had their herds tested in 1925–26 paid approximately £3,000 in fees to the Department of Agriculture, over against which expenditure has to be set the actual increase in yield, amounting to 100 tons of butter, which, at £160 a ton, comes to £16,000, brought about principally by culling and better feeding.

Had these farmers not had the test production figures to induce them to reduce the size of their herds by getting rid of the unprofitable cows, they would have incurred increased labour costs for milking, and if they had not been similarly educated to the value of proper feeding, the production figures would not have been so good. It can be assumed that their herds, as in the cases of those not tested, would have also given decreased yields, equal to 20 lb. butter for each cow, and instead of showing the actual net gain of £13,000 over testing expenses (£30 each member), their decreased yields would have resulted in a reduction of £32,000 (£60 each member) below the previous year's incomes. Thus, each average testing member was £90 better off than his non-testing neighbour for that one year alone—apart from the reduction in labour costs, the improvements effected in the young stock reared, and the increased supply of skim milk for the pigs. This practical illustration of the money benefit derived by these who tested their herds for individual production should induce thousands of others to join the grade herd testing movements.

Australia Must Come Into Line.

There are nearly two and a half million dairy cows in Australia's milking herds. In the best of producing years these average 352 gallons of milk, or 134 lb. butter-fat; in a bad year the figures could be halved. The average herd production works out on the basis of one cow being required to provide for the wants of every three units of population.

In 1925–26 it required 1,700,000 cows to supply local wants on an average per capita consumption of 29 lb. butter, 3 lb. cheese, and 15 gallons of whole milk. The milk and cheese consumption of Australia should be doubled and the butter consumption increased to 34 lb. per head, the present New South Wales figure.

If these increases were accomplished next year, as is possible, a population of 6,400,000 consuming the equivalent of 120 gallons of milk would require 768,000,000 gallons for the year's supply. Our present herds of 2,400,000 cows average 286 gallons of milk per annum. If that were increased to 300 gallons it would only total 720,000,000 gallons, or 48,000,000 below potential requirements.

Take butter production and consumption in Australia. This year the home markets will absorb some 85,000 tons of the highest grade, being equal to an average per capita consumption of 29 lb.; at the increased rate of 34 lb. (New South Wales equalled 33¾ lb. last year), we would require next year 97,000 tons of choicest butter. Twenty per cent. of the output of Australian butter factories is below choicest grade. On a total output of 120,000 tons (which is above the average) there would be 96,000 tons of choicest grade, or barely enough to supply the home trade.

In cheese, consumption has already almost caught up to production. Any increase in the consumption of whole milk must deplete the supplies available for butter and cheese manufacture. Therefore, the rapidly expanding home market for milk, butter, and cheese demands our utmost efforts to increase production.

The low monetary returns from dairying have in the past been a means of discouraging expansion, but this state of affairs is being remedied by increased protective tariffs on butter and cheese, and by the regulation of interstate competition for the local trade. Farmers now have a payable and expanding Australian market to provide for, and should there be any surplus in the future, the continued application of the Paterson scheme will make for an average return over both local and export sales which will meet the cost of production.

Both the market and the opportunity are right here in Australia. Will the dairy farmer rise to the occasion ?

We must have increased yields of dairy produce, and the nation owes it to the dairy farmer to aid him towards that end.

Immediate improvement of the position in Australia can be brought about by—

1. The establishment of an Australian average price for dairy products based on Australian living standards and costs of production, manufacture, and marketing.
2. The increase of the herd yields by better feeding, breeding, selection, and culling, based on systematic herd testing.
3. The improvement of farm methods and pastures, together with conservation of fodder to regulate adequate feeding at all times.

To do these things is to answer the momentous query, "Can we feed our population in the near future with all the dairy products necessary for its well being ?" The lines of production and consumption are converging at accelerating speed, and the matter becomes one of urgency.

The question is not "can it be done ?" for past experience has shown that increased production per acre or per cow is obtainable by following out certain procedure. It resolves itself into whether the dairy farmer will do what is needed. Now that an adequate price is practically guaranteed for the produce of his cows, there is no excuse for neglecting to improve dairy herd production. The farmer can now finance the expenditure involved in doing so through the higher prices which the Australian consumer pays and will pay for those necessities—milk and its products. The dairying industry thus comes into its own. It is placed on the same level as the secondary industries. Cost of production can be obtained, and higher costs that may arise from industrial and other causes can be passed on subject to the limitations of the tariff and the consumers' ability to meet the higher cost of living.

The dairy farmer must not forget, however, that now he is guaranteed a price to cover his costs, he owes a duty to the nation, which he must take immediate steps to liquidate. He must lower his costs of production, manufacture, and distribution by organised effort, so that the consumer can feed his family at less cost, and at the same time give them a greater measure of these necessities of life.

Infectious Diseases Reported in February.

The following outbreaks of the more important infectious diseases were reported during the month of February, 1928:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	13
Piroplasmosis (tick fever)	Nil.
Blackleg	Nil.
Swine fever	1

—Max Henry, Chief Veterinary Surgeon.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.	Date.	
Narrabri (W. A. McDonald)	April	18, 19
Bathurst	„	18, 19, 20
Gloucester (M. Newton)	„	18, 19
Wellington	„	23, 24
Wee Waa (D. B. Martyn)	„	24, 25
Grafton (L. C. Lawson)	„	25 to 28
Wingham (D. Stewart)	„	26, 27
Forster (W. Poppenhagen)	„	27, 28
Casino (P. W. Swanson)	May	1, 2, 3
Maclean (T. B. Notley)	„	2, 3
Moree [illegible]	„	2, 3
Dungog (W. H. Green)	„	2, 3, 4
Kyogle (D. Campbell)	May	9, 10
Coonamble	„	10, 11
Gresford (A. R. Brown)	„	11, 12
Trangie (F. H. Hayles)	„	15, 16
Warren	„	24, 25
Narandera Sheep Show	July	18
Gilgandra (G. Christie)	Aug.	14, 15
Wagga Wagga (F. H. Croaker)	„	21, 22, 23
Junee (G. W. Scrivener)	„	28, 29
Ganmain (C. C. Henderson)	Sept.	11, 12
Melbourne Royal	„	20 to 29
Narandera (J. D. Newth)	Oct.	9, 10

Farmers' Experiment Plots.

Broom Millet Trials, 1927-28.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

EXPERIMENTS were conducted during the past season in co-operation with—

A. Marsh and Sons, Palmer's Channel, Clarence River.
J. P. McDonnell, Tatham, via Casino.

The season during the early spring was extremely dry until the end of September, when there was a complete change in the weather conditions. The dry conditions were responsible for planting not being carried out until October. After planting, however, there was a superabundance of rain.

The effect of fertilising Broom Millet.
Left—2 cwt. superphosphate per acre at planting. Right—No manure.
The freedom of the manured plot from summer grass and the presence of it in the unmanured plot can be gathered from the illustration.

Palmer's Channel.—Soil, alluvial loam; previous crop, broom millet; land ploughed in June and September, 1927, rolled and harrowed just prior to planting; manurial and spacing trials were planted on 4th October. The accompanying photograph gives some idea of the stimulation of growth during the early stages, due to the application of 2 cwt. superphosphate per acre at planting, in comparison with no manure.

By stimulating such quick growth during the early stages a stronger plant is obtained, and cultivation is possible much sooner after the crop is above ground, weed growth being more easily kept in check. These two factors

are very important in millet growing, as the crop is generally very slow during the early stages, and weeds are difficult to control. This point is clearly illustrated in the photograph; cultivation close to the unmanured rows has not been possible owing to the slow growth of the crop, with the result that summer grass (*Panicum sanquinale*) has become well established. It may be mentioned that 5 acres of millet were sown without manure on this farm at the same time as the experiment, but had to be ploughed out owing to summer grass.

It was unfortunate that owing to subsequent heavy rains and water-logging of the area this experiment was a failure.

Tatham.—Soil, alluvial loam; previous crop, lucerne; ploughed June, 1927; worked down and reploughed in August, and then worked down into a good seed-bed at end of September; planted 3rd October. The top-dressing with nitrate of soda was carried out on 23rd December, and harvesting on 25th January.

The rainfall during the growing period was as follows:—

1927.		
October ...	270	points.
November ...	1,001	,,
December ...	337	,,
1928.		
January ...	651	,,
Total ...	2,259	,,

The results were as follows:—

Superphosphate, 2 cwt. per acre at planting; nitrate of soda, 1 cwt. top-dressed on 23rd December, just prior to heading ...	1,328 lb per acre.
Superphosphate, 2 cwt. per acre at planting ...	1,195 lb per acre.
No manure ...	1,264 lb per acre.

From the appearance of the crop in the field it was anticipated that the manured plots would yield considerably heavier than the unmanured plot, as the crop was slightly taller, the stalks were thicker and more healthy in appearance, while the heads were better. During harvesting, however, it was noted that in the manured plots there were a considerable number of strong healthy stalks bearing what is generally known amongst millet growers as the "dummy head." These "dummy heads" have short curly fibres about 6 inches long, and bear no seed. The percentage of these "dummy heads" in the manured plots was fairly high, while in the unmanured plot there were very few. The reason for this high percentage in the manured plots is difficult to understand.

During the previous season a similar experiment was conducted on this farm on less fertile soil, and by the application of 2 cwt. superphosphate per acre there was an increased yield of 1 cwt. per acre; where, in addition to the superphosphate, nitrate of soda was applied as a top-dressing just prior to heading an increase of 50 per cent. in yield was obtained over no manure.

The Characteristics of Various Strains of Imported Bees.

W. A. GOODACRE, Senior Apiary Instructor.

In the interests of apiarists, the Department of Agriculture has imported and tested bees from Italy, Carniola, and Cyprus. We find that, as with the various races of people, the bees from the different countries show distinct variations in colour and characteristics, and a study of them is of much interest and also of value from an economic point of view. A distribution of approved strains of imported bees, following inquiry, has been made to every State in the Commonwealth, the greater distribution having been made in New South Wales.

The Italian Bee.

The first importation of Italian bees was made from Northern Italy, and they were of the true Ligurian, or leather coloured type, in which we find no variation from those imported many years ago.

For the apiarist desiring colour, both the royal progeny and the workers were somewhat of a disappointment, as the third yellow band on the workers was not prominent unless the body was distended, giving the impression to many that the bees were not pure. The queen bees were from being quite dark to an orange colour on the abdomen. In the first distribution of these bees quite a number of apiarists expressed disappointment, judgment, of course, being made from a colour point of view. Later on, however, many of those who in the first instance had voiced dissatisfaction made inquiry regarding their chances of securing a further supply of the progeny, the bees having proved excellent honey-gatherers, and exhibiting other good qualifications.

Although with the queens a rather wide variation of colour was shown, the workers were uniform in their markings, the under portion of their abdomen being quite dark. We consider this dark colour under the abdomen a useful point in the identification of the true Ligurian.

The colonies could be manipulated with a reasonable degree of comfort, but a little more care was necessary in the work to prevent stinging than with the average three-banded Italian. The bees were fairly quiet on the combs—a typical aspect of the Italian bee. The queens were slightly under the average size of the three-banded, but they were excellent layers, the sealed brood being beautifully packed. As a bee for business the Ligurian would be difficult to surpass.

The Three-banded Italian.

Following the importation of the Ligurian, the colour of which did not meet with general favour, an importation was made from Southern Italy (Bologna) of what we could term a three-banded bee. The colour of these

bees has been invariably pleasing, and their qualifications as honey-gatherers are approved of. To compare the recent importation with the original type obtained years ago, I would consider that a certain amount of selection for colour in the breeding has been observed in Italy, for in quite a number of cases the tendency for a fourth band is evident in the bees we obtained. The selection for beauty has, however, not gone too far. The three yellow bands are quite distinct on the workers, and on the under side of the abdomen they have a lighter appearance than the Ligurian. The queens varied in colour, but not so pronouncedly as in the case of the northern type. The size of the queens is quite up to the standard of the average selected local Italian strains.

These bees are quiet on the combs, and gentle during hive manipulations, and over a three-year test we have proved the strain to be good honey-gatherers, and pleasing in other respects. With the mixture of varieties of bees present in Australia, we have found it to be a move in the right direction to revert to the original variety now and again—both from the view of purity of race and for preserving stamina. The Italian bee is eminently suitable for Australian conditions, and following the satisfactory results obtained by our importations from Italy previously, another importation has been approved of for use in the Government apiaries, and for distribution of the progeny to apiarists.

The Carniolan Bee.

Following a good deal of discussion in relation to the qualifications of the Carniolan bee, an importation was made by the Department of a number of this variety. Whilst the Italian bee has proved its worth, we are at the same time looking for a superior bee, if it can be found—hence the desire to test the Carniolan and crosses obtained from the strain.

The Carniolan bees are raised in a cold alpine climate in their native land, and the queens and bees are about the same size as our larger Italians. The queens are dark in colour, and on some occasions show a tendency for an Italian band or two on the upper segments of the abdomen. Since the queens are raised reasonably close to Italy it is quite in order to believe that, in making up this variety, perhaps centuries ago, some Italian blood was introduced. The workers are dark and uniform in colour, and they show prominent silvery lines across each segment of the abdomen. If held by the wings, the bee will bend the abdomen downward, and it will be seen that the silvery colour extends to a fair width under each segment. The more the bee is distended, say, during a honey flow, the more prominent these typical lines become. Except for the lines on the abdomen, the bees are very similar to the old black bees.

Kept in small hives in their native land for many years, perhaps centuries, the swarming tendency has been developed in the Carniolan, and the pure variety is troublesome in this direction. We have reared a good number of queens from the imported ones and crossed them with the Italian, and we find in this Carniolan x Italian that the tendency towards swarming is considerably reduced. The first cross in this case shows up

well in general qualifications, but the problem of maintaining a first cross in an apiary is one which we consider could hardly be worked on an economic basis.

It is considered that the cross between the Carniolan and Italian is superior generally to the cross between the blacks and Italian, but we could not recommend anyone working an apiary of pure Italian, or those looking forward to that standard, to change over to any cross by the introduction of the Carniolan variety. If the Carniolan had proved to us that they were superior to the Italian, and that through the various generations that superiority could, even by the frequent introduction of pure blood, be well maintained, we would have been prepared to advise beekeepers to go in for the strain, for the bees we desire are the ones which give the best return financially and which may be worked with an ordinary degree of comfort.

In a recent report from the Bee Division, Department of Agriculture, Dominion of Canada, by the Dominion Apiarist (page 8), an interesting article is printed under the heading "Carniolan *versus* Italian Bees." A test between these two races of bees was continued for the third year. At the first examination, the Carniolan colonies had an average of 9.2 combs covered with bees, while the Italians covered approximately 8.8 combs. At the second examination, however, the Italian colonies appeared to be stronger in bees and brood, and practically maintained this lead throughout the season. The apiary was visited and the colonies examined once every ten days throughout the season. A comparison of the honey crop is given in the report mentioned, and it is apparent that the Italian leads easily. It is mentioned in the same report that the Carniolan showed more inclination toward swarming than did the Italian.

We have proved that the cross between the Carniolan and Italian shows some good results, and it may be possible, by close attention to selection in breeding, to produce a new type of bee which will reproduce to a standard from these two varieties. Many of the true varieties found in the various countries to-day have been built up by introduction or immigration of different races from other parts. Whether an Australian bee could be evolved from these varieties which would be superior to the Italian is a matter worthy of interest.

The Cyprian Bee.

To test the Cyprian variety, the Department was successful in obtaining some direct imported stock. The general opinion regarding this bee is that the colonies cannot be controlled with a reasonable degree of comfort. Our tests suggest that the matter of climatic conditions has some effect on the temperament of this variety, for during favourable weather conditions at Wauchope we have worked Cyprians for several months of the year without any appreciable difference from the control methods used for the average Italian. Toward the autumn, however, they were very difficult to manage. With climatic conditions favourable for the Cyprian, we would say that they could be worked with a degree of comfort. Messrs. McNamara

Bros., of York, Western Australia, advise that the Cyprian can be reasonably easily controlled there during the whole of the season. From Cyprus we are advised that they are in no way vicious. In other parts, such as many of our inland districts, it is difficult to manage the strain at any period of the season. Our test of the Cyprian did not give us sufficient encouragement to warrant a distribution of the progeny.

The Cyprian in colour is very similar to the three-banded Italian, and slightly smaller in appearance. The queens are very prolific and raise large numbers of queen cells. Rather more propolis is fastened about the hive than is desirable. They have fairly good honey-gathering qualifications, but the temperament of this variety is its most serious drawback. The workers are fussy on the combs during manipulation, and it is rather difficult to locate the queen on account of the excitement. During the autumn, when the bees are excitable, the use of smoke as a control measure is of little avail, as the bees simply dance about the top of the frames fanning the smoke away with their wings, and are quite prepared to start stinging when the smoker is put down to allow operations to commence. The fussy characteristic is well maintained in the various crosses we tried from this variety.

In the selection in breeding up for colour in the Italian race to produce the Golden, the Cyprian has been used often, but not invariably so.

The Need for Research on Bud and Stock Selection.

The wonderful results from bud selection in the United States show the necessity for similar work in Australia. Considering the long life of a citrus tree, it is obvious that only the best is good enough for planting. Unfortunately, orchards have been planted in the past without much regard for this aspect, and many of our present trees need rooting out or re-working. If we can improve our present production per acre, we shall lessen our cost of production. If we can raise our standard of quality we need fear no competition on the world's market. Both improvements can be readily obtained by bud and stock selection.

This should be treated as a Commonwealth matter, and not as the concern of each individual State. The continent should be combed to find the very best trees. Growers should be able to obtain buds from such for the re-working of any unsatisfactory trees, and should obtain approved pedigree stock for future planting.

I suggest that the co-ordination of such work might be undertaken by the Council for Scientific and Industrial Research. The work of the selection of parent trees and eventual selection of the buds should be done by the Department of Agricultture of the various States. Out of the selection of trees so made, the Council should choose only those of best performance, and arrange for their propagation, either by a nursery established under its auspices, or by arrangements with some of the present nurseries.—From the report on an Investigation of American Fruit Methods by W. Granger, General Manager, Direction of Fruit Marketing, Brisbane.

Lucerne as a Pasture Plant on Hilly Country.

Boorowa District Furnishes an Example.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

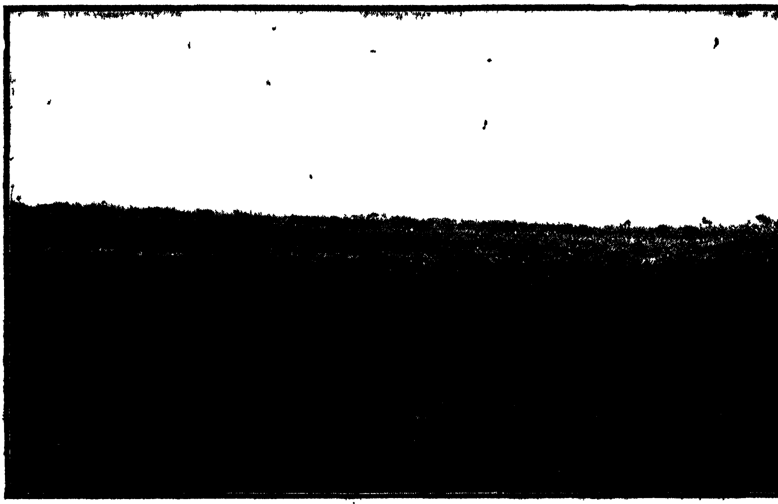
For some years past the Department has recommended the use of lucerne for pasture purposes in the drier and colder districts of this State. A plant having the deep-rooting habit, cold and drought resistance, plus the high fodder value of lucerne must necessarily take a foremost place in our list of pasture plants. Grown singly or in a mixture with grasses it will be found to provide excellent grazing in normal seasons, while in unfavourable periods such as the State has just passed through it provides useful grazing when most pasture plants are unproductive. This is particularly noticeable in districts depending largely on annual herbage (clovers, trefoils, &c.); when autumn and winter rains fail seeds of these plants do not germinate to provide winter and spring feed, and an area of established lucerne will greatly assist in tiding over these periods.

As a result of trials in many parts of the State it has been conclusively proved that the growing of lucerne, especially for grazing purposes, need not be confined to first quality river flat country. On the contrary, it can be readily established on most soils provided they are not too clayey and are of sufficient depth to allow the plants to form a deep rooting system. In cold districts where soil drainage is defective lucerne will not prove successful, as it will not survive long where the soil is cold and wet through the winter months.

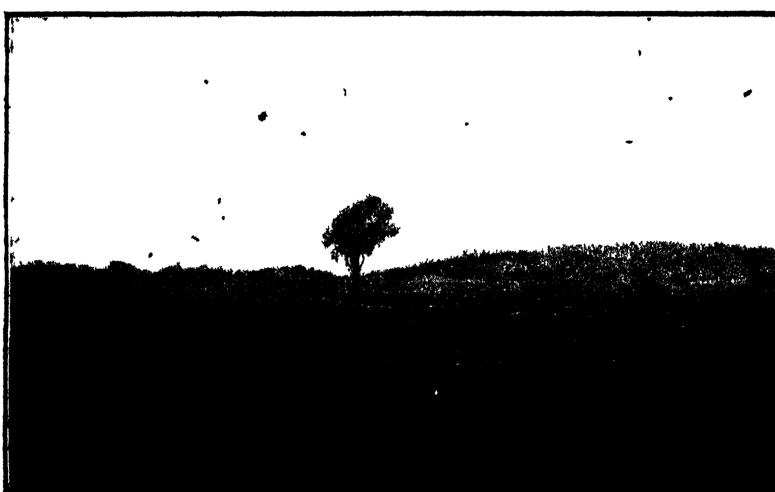
A striking illustration of the utility of lucerne is provided on the property of Mr. James Barnes, "Suffolk Vale," Boorowa, where an area of between 700 and 800 acres has been established. Of this area, about 600 acres are growing on hilly country, and the remainder on creek flats. The experience gained on this property may be of interest and value to graziers in similar localities and (with modifications) in any locality where lucerne can be grown for grazing purposes.

The Boorowa district is situated on the south-western slopes, the height above sea-level being about 1,600 feet, and the country being undulating to hilly, the winters are cold, and heavy frosts are experienced. The rainfall (average for forty-five years—22.67 inches) mostly occurs during the winter months. The natural grasses and clovers found in this district are of good quality and under ordinary conditions, about one and a half sheep per acre are carried. By the use of lucerne for grazing, the sowing of grasses and clovers, and the top-dressing of natural pastures, the carrying capacity of this country will ultimately be much increased.

Lucerne was sown eight years ago on hill country on "Suffolk Vale," the soil being a grey granite, fairly free working, but setting hard on the surface, specially during the winter months. The rate of seeding was 6 lb. per acre and a good germination resulted. Grazing has been carried out on this



A section of the 600 acres of grazing lucerne.
Note the good clean pasture and the absence of weeds.

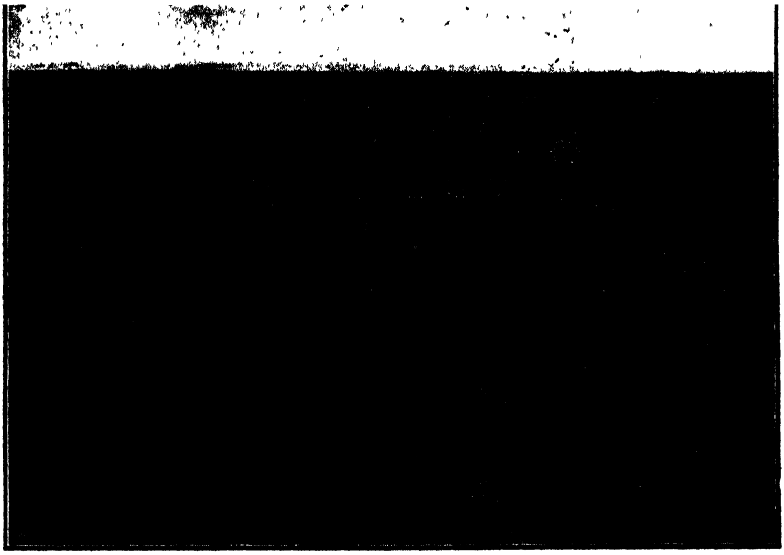


Sheep grazing on lucerne growing on hilly country.

area ever since, and the stand is still thick, and the growth vigorous and healthy. For a number of years the lucerne was grazed continuously, and it was found that barley grass (*Hordeum murinum*), corkscrew (*Stipa setacea*) and saffron thistle (*Carthamus lanatus*) were obtaining a hold in

the paddocks. For the past three winters the area has been cultivated with rigid tine cultivators in July, August, and September, and top-dressed in August and September with 1 cwt. superphosphate per acre. This treatment, with an occasional mowing, has had very beneficial results, the paddocks now being free from the intruders mentioned, and an earlier spring growth being obtained.

The 600 acres sown on the hills is now divided into six paddocks, and these are grazed in rotation—a most satisfactory scheme, having in mind the life of the lucerne stand. From 800 to 1,000 sheep are turned into a



A near view of lucerne growing on a hillside.

The carrying capacity of this pasture is much greater than the natural pasture.

100-acre area and grazed for about two weeks, the period varying, of course, according to the growth of the lucerne. The paddock is then spelled for about two weeks, and by this time sufficient growth has been made for further grazing.

Under these conditions it is found that a moderate estimate of the carrying capacity of the lucerne is from five to six sheep per acre during the warm months of the year, and two sheep per acre during the winter, so that it provides grazing the whole year round.

A point of importance is that lucerne provides good clean grazing for lambing ewes until the seeds have dropped in the grass paddocks, and the same applies for the fattening and topping-off of lambs for market. Excellent prices have always been obtained for lambs topped-off on the lucerne area.

In addition to the grazing provided by the lucerne on this property, occasional cuts are made and the hay is pressed. It is found that pressing the hay is a big improvement on harvesting loose hay for the following reasons:—

1. It is pressed in the field, the press being driven up between the windrows, and therefore the hay holds more leaf than when handled and carted to the barn.

2. A minimum of storage space is required.

3. During times when the natural pastures fail and artificial feeding has to be carried out, as in the past winter, pressed hay is much more economically handled than loose hay. It is found that one man can feed 5,000 ewes a ration of lucerne hay, 1½ lb. and linseed nuts 2½ oz. per day, when using pressed hay. This is considerably more than could be fed by one man with loose hay.

In connection with grazing stock on lucerne, many farmers are inclined to over-estimate the liability of trouble through hoven or bloat, but on "Suffolk Vale" no such trouble is encountered, and the only precaution exercised is to see that sheep are not turned into succulent lucerne when hungry.

Subterranean clover has also been tested on similar country to that carrying the lucerne, but the results from lucerne are far superior to those obtained from the clover. The latter, however, can be utilised on partly-cleared land, stony ridges, and shallow soils where it is impossible to establish lucerne.

The results with lucerne indicate that, with efficient management, the crop will do more than any other to help solve some of our problems of pasture improvement.

THE BETTER FARMING TRAIN.

ON its second northern tour, the Better Farming Train will visit the following centres on the dates shown:—

April 18	Quirindi.	April 25	Denman.
„ 19	Willow Tree.	„ 26	Singleton.
„ 20	Murrurundi	„ 27	Branxton.
„ 21	Scone.	„ 28	Wyong.
„ 23	Muswellbrook.	„ 30	Gosford.
„ 24	Merriwa.		

At each stopping-place the train will be open to the public, free of charge, from 10 a.m. until 9 p.m. A programme of demonstrations and lectures will be carried out during the day, in a large tent near the Train, and hot water is freely provided for visitors who wish to lunch at the Train and not miss any feature of the programme.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

***Wheat*—**

Bald Early	Manager, Experiment Farm, Trangie.
Bena	G. C. Chapple, "Ondiong," King's Vale.
	H. J. Harvey, Kindalin, Dubbo.
	T. Jones, Birdwood, Forbes.
	Hobson Brothers, Glenlea, Cunningar.
	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	W. J. Coddington, Granite View, Murrumburrah.
	N. G. Bourchier, Deniliquin-road, Finley.
	Smith Bros., Hillside, Harden.
	Manager, Experiment Farm, Cowra.
Cadia	Manager, Experiment Farm, Bathurst.
Canberra	E. J. Johnson, "Iona," Gunningbland.
	Quirk and Everett, "Narrawa," Wellington.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong" King's Vale
	H. J. Harvey, Kindalin, Dubbo.
	T. Jones, Birdwood, Forbes.
	W. R. Carter, Allambie, Narromine.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Bathurst
Cleveland	W. Burns, Goongiwarrie, Carcoar.
	Manager, Experiment Farm, Bathurst.
Currawa	Quirk and Everett, "Narrawa," Wellington.
Duri	R. Penfold, "Edaville," Quandialla.
Federation	E. J. Johnson, "Iona," Gunningbland.
	H. Owen, "Apple Grove," Duri.
	E. K. King, Karrindee, Uranquinty.
	W. R. Carter, Allambie, Narromine.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle Road, Parkes.
	W. A. Glenn, "Maneroo," Thyra-road, Moama.
	N. G. Bourchier, Deniliquin-road, Finley.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Bathurst.
Firbank	Manager, Experiment Farm, Trangie.
Florence	Manager, Experiment Farm, Trangie.
Gresley...	H. J. Harvey, Kindalin, Dubbo.
	Manager, Experiment Farm, Temora.
Hard Federation	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Bathurst
Improved Steinwedel ...	Manager, Experiment Farm, Trangie.
Major	E. K. King, Karrindee, Uranquinty.

Wheat—continued.	
Marshall's No. 3	A. E. Kingham, Farm 1445, Murrami.
	B. J. Stocks, Linden Hills, Cunningar.
	J. Berney, Eurimbla, Cumnock.
Merredin	T. W. O'Brien, "Cooberang," Junee Reefs.
Nabawa...	Cullen Bros., Bunglegumbie, Dubbo.
	H. J. Harvey, Kindalin, Dubbo.
Nizam	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	N. G. Bourchier, Deniliquin-road, Finley.
Riverina	Quirk and Everett, "Narrawa," Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
Turvey...	Quirk and Everett, "Narrawa," Wellington.
	E. A. Michael, Hill View, The Rock.
	Watt Brothers, "Fairy Mount," Cumnock.
	T. M. Slattery, Mirrool.
	H. J. Harvey, Kindalin, Dubbo.
	Hobson Brothers, Glenlea, Cunningar.
	W. G. Law, Wattle Park, Armatree.
	Hannett Bros., "Bonefoi," Cunningar.
Union	H. J. Harvey, Kindalin, Dubbo.
Waratah	E. J. Johnson, "Iona," Gunningbland.
	P. Page, Duri.
	Quirk and Everett, "Narrawa," Wellington.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	W. J. McGrath, Avon, The Rock.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	J. McGrath, "Berra Lea," Goonumbla.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	Chaffey Bros., Nemingha.
	Manager, Experiment Farm, Trangie.
	T. Jones, Birdwood, Forbes.
	H. J. Harvey, Kindalin, Dubbo.
	E. K. King, Karrindee, Uranquinty.
	Watt Brothers, "Fairy Mount," Cumnock.
	B. J. Stocks, Linden Hills, Cunningar.
	W. R. Carter, Allambie, Narromine.
	W. J. Coddington, Granite View, Murrumburrah.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle Road, Parkes.
	J. Berney, "Kildara," *via* Cumnock.
	Manager, Experiment Farm, Temora.
Wandilla	Manager, Experimet Farm, Temora.
Wandilla King...	A. E. Kingham, Farm 1445, Murrami.
	P. Gaynor, "Underwood," Ariah Park.
	A. A. Groves, "Aberfeldie," Barmedman.
	Quirk and Everett, Narrawa, Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	G. C. Chapple, "Ondiong," King's Vale.
	Bradford Brothers, Nubba.
	H. J. Harvey Kindalin, Dubbo.
	Hobson Bros., Glenlea, Cunningar.
	T. M. Slattery, Mirrool.
	R. A. Harricks, Horseshoe Vale, Warre Warral.
Oats—	
Algerian	J. Lyne, Farm 1636, Yenda.
	W. H. Swain, Riverview, Peak Hill.
Barley—	
Cape	Manager, Experiment Farm, Bathurst.
Peas—	
Greenfeast	R. C. Howard, Huntley, *via* Orange.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

April.

E. HADLINGTON, Poultry Expert.

During this month preparations will require to be made for the coming breeding season. April is none too early to make a preliminary selection of birds for the breeding pens, so as to have them settled down in readiness to commence setting eggs from the 1st of June, which means that the eggs will have to be saved during the last week in May. It is desirable, therefore, that all the main pens should be mated early in May. Many of the hens will be in moult, of course, at that time, and these will have to be left until they have "feathered up" before a proper selection can be made.

Poultry farmers who appreciate the importance of early hatching will find it necessary to use well-developed early pullets to get sufficient eggs to make an early start, and this raises the question of the advisability of using pullets and cockerels to breed from.

Breeding from Pullets and Cockerels.

Some farmers use only their first and second year birds for the breeding pens because they fear that pullets will not produce strong chickens; the result is that frequently they are unable to hatch out many chickens until August owing to the hens not being in laying condition early enough. This would then preclude breeding from pullets and cockerels early the next year, as there would not be enough of suitable age to select from early in the season.

To reassure those who are in doubt about the matter, it may be stated that observations over many years of breeding from pullets and cockerels have shown that there is no deterioration if well-developed birds of strong constitution and ten months old or over are used.

Weight as a Guide in Selection.

The question as to what constitutes well-developed birds is often raised, and in this connection it might be stated that weight is a good guide, and the following weights should be regarded as the minimum when selecting birds for the breeding pens:—

Light breeds, such as Leghorns, Anconas, &c.—Cockerels, 5 lb.; pullets, 4 lb.

Heavy breeds, such as Orpingtons, Langshans, Plymouth Rocks, Rhode Island Reds, &c.—Cockerels, 7 lb.; pullets, 5 lb.

Cocks and hens in each case should be at least 1 lb. heavier. Robust birds, ten months old and over, complying with these weights and possessing type and the characteristics that denote productive qualities (bright alert appearance, large prominent eyes, fine skull, face free from wrinkles and feathers) will be found quite satisfactory as breeders.

There is no objection to mating together pullets and cockerels of the above description, but where possible the ideal would be to mate a cock with pullets and a cockerel with hens.

Is Early Hatching Profitable?

When dealing with the subject of early hatching one is frequently confronted with the argument that early hatched pullets break into a moult just when eggs are high in price. While this to a large extent is true, there are other factors to be considered, and these will be found to outweigh the loss sustained by the moult.

In the first place, early hatched chickens thrive better than those hatched late in the season, better prices are obtainable for the early cockerels when marketed, the pullets come on to lay some months before they break into a moult, and after the moult they mostly come on to lay again before the hens, and are all the better as breeders after having a spell. On the other hand, chickens hatched in September and October meet with crowded conditions and variable weather, which necessitates more judgment in operating the brooders especially at night, and when they are about half grown they encounter the full heat of summer. This causes a partial cessation of growth for a time, resulting in the pullets being later coming on to lay, and they would not be suitable as breeders until late in the spring, if at all.

Late Moulters.

In selecting hens for breeders, birds should not be chosen which have not moulted when required to breed from. This mistake is frequently made, the idea being that these late moulters have been the best layers, and are probably the ones laying the most eggs when it is desired to commence incubation, but the very fact that they have been heavy layers and have not had a spell renders them unfit subjects for the breeding pen, as they must naturally suffer from the strain of continuous heavy laying, and would not produce as strong chickens as those which have had a rest. Not only so, but very often they break up soon after they have been penned, in which case the pens have to be disturbed by substituting other birds.

The best hens to use are those which have moulted in the proper season, *i.e.*, from February to April, and which are showing signs of coming on to lay again when required. Heavy production can only be sustained by rearing strong, healthy chickens, and the way to ensure such is to breed only from birds in the best of health and constitutionally sound.

Flock Mating.

There is a growing tendency to resort to "flock mating" instead of having a number of single matings—*i.e.*, one male to a given number of females, which is usually ten to twelve in light breeds, and eight to nine in heavy classes. The reason, of course, is to save time, and in the case of beginners to save the expense of erecting the necessary small pens.

It is regrettable that "flock mating" is becoming so general in practice, because it is a retrograde step, and must be condemned on account of its bad effect on the industry. No farmer can select birds for a large "flock mating" which would be as uniform in type and character as he could for pens of say ten hens and a rooster, and it must be remembered that uniformity is essential to secure the best results in production, and in maintaining breed character.

There are so many factors which are tending towards bringing down the average quality and stamina of our flocks that it is felt that a warning is necessary to indicate where we are heading. Heavy losses in rearing, under-sized birds, and a large percentage of small eggs are the danger signs, and every effort should be made to effect improvement before it is too late. Now that the breeding season is at hand is the time to take stock of the position as it affects each individual farmer, and any weaknesses should be mended.

As a first step, every farm should have a fair proportion of single matings, sufficient at any rate for producing stock for the breeding pens the next year. Select only hens of good physique, uniform size and type, and mate a male bird which conforms to the same standard, avoiding too close relationships. The pullet progeny of flock matings should be regarded only as layers, and the cockerels as market birds. They should not be used as breeders.

Management of Breeding Stock.

Having selected the right class of birds for the breeding pens, the next important matter is their care and management.

In the first place the male birds should be examined to see if they are infested with vermin, which they mostly are. In any case it is just as well to dust flowers of sulphur thoroughly through their feathers, making sure that no part is left undusted; where the lice are numerous the dusting should be repeated a week later. A further inspection of the birds should be made during the season, as good results cannot be expected from birds which are worried by vermin.

The best method of treating the birds is to use a shallow wooden tray, large enough to lay one bird upon, so as to catch the surplus sulphur, which can be used over again.

The houses should also be examined for red mites, and if found they should be sprayed a couple of times with kerosene emulsion, and the perches painted with wood-preserving oil, or creosote, &c. Care is necessary where white birds are kept to prevent them becoming smeared with oil, which detracts from their appearance.

Feed the Male Bird.

Very often poor fertility and dead-in-the-shell are caused by the male bird getting poor through allowing the hens to eat up the food whilst he parades around. For this reason it is a good plan to give the male a feed of whole maize by himself at midday, or, in some cases, where the bird is getting poor, at the evening feed as well. This can be done by shutting the hens in the houses and leaving the rooster in the yard. After a week or so very little trouble is experienced in separating the birds, as they soon learn what is required.

Another important matter is to avoid the use of too much concentrates, as this also is a common source of bad hatches. Where a meat meal, or similar concentrate containing a high percentage of protein is used, it is well to reduce the quantity for the breeding stock. Thus, for example, if a 50 to 60 per cent. protein meal is used, not more than 4 to 5 per cent. should be given to the breeders.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
A. V. Chaffey, "Lilydale," Glen Innes	15	25 Feb., 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 ,, 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	80	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	88	11 ,, 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 ,, 1928
Department of Education, Mittagong Farm Homes	30	22 ,, 1928
Sacred Heart Convent, Bowral	11	23 ,, 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 ,, 1928
Dominican Convent, Moss Vale	4	24 ,, 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	118	20 ,, 1928
Marist Brothers' Training School, Mittagong	80	25 ,, 1928
Blessed Chanel's Seminary, Mittagong	3	26 ,, 1928
Waiaroi College, Orange	4	2 Sept., 1928
J. L. W. Barton, Wallerawang	16	11 Oct. 1928
King Bros., Hygenic Dairy Company, Casula, Liverpool	94	19 ,, 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 ,, 1928
Department of Education, Hurlstone Agricultural High School	33	10 ,, 1928
Department of Education, Eastwood Home	16	16 ,, 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 ,, 1928
Lunacy Department, Rydalmere Mental Hospital	68	25 ,, 1928
Lunacy Department, Callan Park Mental Hospital	20	26 ,, 1928
Miss Brennan, Arrankamp, Bowral	24	29 ,, 1928
Department of Education, Yanco Agricultural High School	34	12 Jan., 1929
H. Doggrell, Leicester Park, Mittagong	53	6 ,, 1929
New England Girls' Grammar School, Armidale	15	12 ,, 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
Lunacy Department, Kenmore Mental Hospital	99	17 ,, 1929
Tudor House School, Moss Vale	6	22 ,, 1929
Lunacy Department, Orange Mental Hospital	8	22 ,, 1929
Australian Missionary College, Cooranbong	57	24 ,, 1929

—Max Henry, Chief Veterinary Surgeon.

Orchard Notes.

APRIL.

C. G. SAVAGE and H. BROADFOOT.

THERE may be differences of opinion as to whether advertising would increase the *per capita* consumption of fruit in New South Wales. Generally speaking, Australians are good fruit eaters, and they indulge their tastes irrespective of any form of printed advertisements, no matter how attractive they may be. On the other hand, fruit consumption has without doubt received some impetus from the greater attention given to articles on dietetics by popular writers and by food experts, in which the value of fruit as a source of certain vitamines and salts has been stressed. More might be done in this direction. Fruit is undoubtedly part of a well-balanced dietary, and its advantages cannot be too strongly emphasised. The real need of the situation, however, is the solution of the distribution problem. Advertising through the medium of newspapers, magazines, and attractive posters would have to go hand in hand with more effective, widespread, cheap, and rapid distribution of fruit, so that those whose homes are far removed from fruit-growing centres could share, at reasonable cost, the health-giving products of our orchards. Only thus would grower and consumer gain maximum benefit. If advertising is in the hands of sectional associations, there is the danger of one-sided advertising; the value of the orange may be extolled at the expense of the apple, the value of the various pomes at the expense of the drupes, or the value of any of the foregoing at the expense of the grape.

What is required is a sustained and widespread organised effort to bring before the public the particular class of fruit which at any given time is in greatest supply or in excess of the demand. Every variety of fruit has its season, and at some particular period reaches peak production; all have their value and all have their appeal to the public, and thus whilst public attention was being directed to the value of fruit in the dietary on account of its health-giving properties and its palatability, attention could be chiefly directed to the fruit which was available in abundance at the time. All-round good might then result.

As it is, a good deal of effective advertising goes on in the form of attractive displays in fruiterers' shop windows, stalls, and on street vendors' barrows. Possible consumers are frequently diffident owing to the inferiority (sometimes very marked) of fruit at the back of the pile. If the buyer finds a similar disparity between the appearance of the fruit supplied to him and that pictured in an attractive pictorial advertisement, the natural cynicism aroused might have a deterrent effect upon his future fruit demands.

Public confidence in advertising must be gained if advertising in any shape or form is to be effectively maintained. To play upon supposed public gullibility is in the end fatal to the success of any advertising scheme. Even

amongst fruitgrowers, honest though most of them are, there are some who are not to be depended upon, and this accentuates the need for any general scheme of pictorial advertisement to be in the hands of representative, non-sectional organisations, in which individual greed will be completely subordinated to the general good. Apart from this, there is the further consideration that extensive advertisement is too expensive for the individual grower, and he could not be expected to pay for advertisements which would largely benefit others besides himself. If one citrus grower, for instance, advertises the value of oranges, he benefits all orange growers; where all benefit, all should share the expense.

It is the stone fruits which in time of glut involve growers and retailers in greatest losses. Citrus fruits may remain on the tree for some considerable time, pomes may be placed in common or cold storage, but many drupes must be sold quickly or perish. When a glut is expected attractive advertising might help to relieve the situation, but it can only do so to any appreciable extent if some satisfactory method of cheap, rapid, and reliable distribution can be applied.

It might be pointed out that the foregoing applies only when the production of fruit is about equal to the demand and short glut periods of a temporary nature occur. When the production in a normal season is far in excess of the demand, and there is all-round over-production, all the advertising possible, combined with quick and efficient means of distribution, will not relieve the situation. It is quite true that the consumption of fruit may be considerably increased, but it may not be increased to such an extent as to give the grower a reasonable return for his product. At the present time there is more of certain kinds of fruit produced in the Commonwealth than can be sold in the Commonwealth; hence it is necessary, in order to relieve the congestion in our own markets and make fruit-growing a paying proposition, to market fruit outside the Commonwealth, in the form of either fresh, dried, or canned products or of the juices, according to the purpose to which the particular fruit is best suited.

It may be mentioned that so far as New South Wales is concerned some of the kinds of fruit grown are in excess of the local demand, and large quantities must be exported; on the other hand, some kinds do not meet requirements. Of the latter, apples may be given as an example. That the quantity of this fruit produced in New South Wales is below the requirements of this State is attested by the fact that thousands of cases of apples are imported from other States every year. The production of apples in the Commonwealth, however, is far in excess of the demand, and large shipments are sent to the United Kingdom, as well as other places, each year.

Large supplies of apples from other States might be responsible for a glut, and if New South Wales growers went to the expense of trying to increase the demand by advertising and by improving the means of distribution, they would be doing so to the advantage of growers in other States, who would be

contributing nothing towards the expense. If trade in fruit between each State was evenly balanced, and each State advertised and tried to improve distribution of any fruit which was on the market, irrespective of what State it came from, conditions would then be more satisfactory. But such is not the case, and it is obvious from the above that to arrive at any equitable arrangement, as far as advertising goes, each State should co-operate and try to evolve some scheme which would improve fruit distribution and consumption at home and abroad, at the joint expense of the whole of the States concerned.

Notes on Picking and Packing.

The harvesting of late varieties of apples and pears is still in progress. The picking of fruit is an operation which needs to be carried on with the greatest care if satisfactory results are to be secured. Even growers who are most careful with all the other orchard work are less careful than is desirable in fruit picking. Nothing should be done to injure the skin of the fruit; it is essential that it be kept in sound condition, so that it may present an unblemished front to agents of decomposition. Fruit may be injured by dropping it carelessly into picking bags, by tumbling it roughly into boxes, by carting it carelessly over rough roads; it is absolutely essential (and this cannot be too strongly emphasised) to pick, handle, and pack fruit with care if it is to arrive at the market in good condition.

So far as packing is concerned, it is necessary to avoid packing fruit so loosely that it allows movement in the case, or so high that bruising is unavoidable when the lids are nailed on.

Planting Citrus Trees.

Provided the situation is not liable to autumn frosts, and the soil is in good moist condition, citrus trees may be planted. There are certain precautions to be observed—precautions which, though obvious, are sometimes neglected. The roots should be thoroughly protected against sun and wind during transference of the tree from nursery to orchard, and weaklings should be unhesitatingly rejected. Only those trees which are strong and are possessed of a good root system should be chosen; before planting, broken roots should be cut cleanly away with a sharp instrument and the roots dipped in a puddle. As to depth of planting, the grower cannot go wrong if he plants at the same depth as the trees grew in the nursery.

Woolly Aphis.

Where the parasite *Aphelinus mali* is not well established, trees which are badly infested with aphis should be given a good spraying with tobacco wash or nicotine extract as soon as the fruit has been picked. When spraying for this pest, use plenty of force to break up the clusters of aphis; to apply nicotine extract in the form of a mist for the control of this pest is time and money wasted.

Fumigation.

Fumigation may be continued during April, but growers would be well advised, if they desire that the fruit should be free from red scale by the time it is ready for picking, to finish the work as soon as possible. The completion of the work at an early date is also desirable if white wax is present. A leaflet on fumigation can be obtained free from the Department.

Codling Moth.

It is pleasing to note that the depredations of the codling moth were not so great this year as last. This should not lead growers to lessen their efforts to cope with the pest; it should rather make them determined to persevere with stringent measures so as to get as near as possible to complete extermination of a destroyer which exacts heavy toll if not kept in check.

The most important phase in connection with moth control this month is the destruction of infested fruit. It must be borne in mind that it is the carry-over grubs which start next season's infestations. It is of paramount importance to attend thoroughly to the destruction of infested fruit. If this is not gathered and promptly destroyed at short intervals, many grubs escape and get into sheltered positions where they winter-over unnoticed, even though a most diligent search has been made by the grower with the object of destroying as many as possible. It is evident that the best results can be achieved, especially in closely settled districts only by the united efforts of all apple and pear growers; spasmodic and sectional efforts cannot produce the best results.

Efficient Milking Means More Milk.

The efficiency of the milker is a recognised factor affecting the amount of fat in cows' milk. In discussing this aspect of the subject in "Agricultural Research in 1926," J. Mackintosh draws attention to the experiments conducted by Read and Mead, who, in trials with four cows, found that by leaving about half the milk in the udder at one milking the weight of milk obtained at the milking immediately succeeding the incomplete milking was always appreciably greater than usual, but the increase did not equal the amount that had been left in the udder, and there was therefore a definite loss. In respect of the fat percentage, an increase of 0.27 pr cent. fat was obtained on the average for the two days (four milkings) immediately following. The amount of the increase varied from cow to cow, and it appeared possible that an increase of over 0.5 per cent. fat might be obtained from some animals. Further, the increase was not always greatest at the first milking following the partial milking; out of twenty-seven trials there were twelve in which the highest fat percentage was reached at the second milking after the partial milking, *i.e.*, twenty-four hours later.

Nevertheless, the increase in the weight of milk and in the fat percentage did not give a weight of fat equal to the amount which had been left in the udder, and here also the incomplete milking led to a definite loss of fat.

CONTENTS.

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Agricultural Gazette of New South Wales.

The Maintenance of Soil Fertility in Wheat Districts.

E. S. CLAYTON, H.D.A., Senior Experimentalist.*

WHILE farmers are concerned almost entirely with the immediate return from their land rather than with the future state of fertility of that land, they, at the same time, realise that it is advisable to keep their land as productive as possible, and not exhaust its inherent ability to produce profitable yields. The balance between present returns and future fertility must be so maintained that neither is so drastically favoured as to adversely influence the other. Any system of farming which ensures the maintenance of soil fertility, but takes no heed of the necessity for the immediate utilisation of the land is of no real value to us. On the other hand, many farmers are realising that some of their farming practices are exhausting the fertility of the soil (*e.g.*, continuous wheat) and so are seeking means of maintaining the fertility without reducing immediate profits.

Mineral Constituents.

In New South Wales most of the wheat soils are fairly well supplied with the minerals required by plants. The one plant-food that wheat crops respond to is phosphoric acid. Even here the deficiency is not great and dressings of 56 to 112 lb. of superphosphate per acre suffice, even in the Riverina, south-western, and western districts, where the deficiency is greatest. The possibility of wheat soils becoming depleted of any particular mineral constituent other than phosphoric acid need cause no concern whatever. The question therefore of maintaining the mineral elements resolves itself into the application of moderate dressings of superphosphate with each crop on those soils that require such treatment.

Signs of Soil Depletion.

Soil analyses have shown that cultivation usually has the effect of reducing the amount of organic matter in the soil, and old cultivation land under dry-farming conditions never contains as much organic matter as it did when virgin. When such country happens to be undulating, nature calls attention to the fact of this depletion by severe soil erosion. Examples of this soil depletion and consequent erosion may be seen in the Harden-Cowra district. Soil washing occurs when the land cannot absorb water as quickly as it is supplied by precipitation. This absorption takes place in proportion to the amount of organic matter in the soil, and consequently surface run-off becomes more pronounced as the organic matter is depleted.

* Paper read at the Agricultural Bureau Conference at Forbes, March, 1928.

Although soil erosion may be temporarily checked by modifying the cultural operations, it can only be definitely prevented by increasing the organic matter in the soil.

Physical Condition.

As a rule, the lighter soils are those most readily exhausted by cultivation, but it is also found that some of the very heavy soils behave badly when subjected to unfavourable cropping systems. Usually, however, it is due in this case to the land being so thrown out of condition as to render it almost impossible to obtain a suitable tilth for the profitable growing of wheat. In such instances the application of gypsum at about 1 ton per acre has greatly improved the physical condition, and has made the production of payable crops again possible. Gypsum also is valuable on those soils that are naturally heavy and refractory. On such soils it acts like a charm, and will make all the difference between success and failure.

Humus Content.

Old wheat land is rarely as productive as it was during the first few years of cultivation. Whether this is due to the loss of organic matter has not been satisfactorily determined. The general opinion, however, is that such is the case. If it were necessary to maintain wheat soils at their original humus content in order to obtain continuously satisfactory yields, the outlook would be most depressing, for we find it practically impossible to do so under dry-farming conditions. Fortunately, in actual practice, we find that it is not necessary. It is, however, imperative that some attempt be made to maintain the humus content at a reasonably high level, otherwise the physical condition of the soil becomes so unsatisfactory that profitable yields cannot be produced. Also, when the humus content of the soil is reduced by abuse below a certain level, it is found to be economically impossible ever to bring it up to a satisfactory level again for the reason that just those soils which are most in need of organic matter are the very ones on which it is impossible to grow sufficient bulk of crop to plough in to recuperate them. It is advisable therefore never to allow soils to approach this danger mark. Once they reach it, they can be considered exhausted.

We are faced with the fact that the chief factor in the maintenance of soil fertility appears to be the humus content, or that particular condition of the soil that the presence of sufficient humus brings about. Our climate and methods are rather wasteful of humus. It is advisable always to burn wheat stubble to minimise fungous diseases, but this in itself is not so wasteful of humus as might appear. All our field experiments have proved that when straw is ploughed in the yield of wheat is lowered. This reduction in yield is due partly to the detrimental effect of the straw on the physical condition of the soil (leaving it too loose and open), and partly to the effect it has on the nitrogenous content. When crop residues are ploughed in, it has been found that the amount of humus formed depends to a great extent on the amount of nitrogen contained, not simply on the bulk or weight of the material. If a residue like straw is ploughed in, only a small amount of

humus is added to the soil, for the reason that straw contains very little nitrogen, and the bulk of the material is consumed by the soil bacteria and lost as carbonic acid.

The best means of adding humus to the soil is by ploughing under leguminous crop residues which are rich in nitrogen. They can be either ploughed in direct, or fed off to stock, and the droppings and residues ploughed in. The latter is the most economical method.

We are faced, therefore, with the necessity of finding a leguminous crop that can be utilised profitably. Field peas do not fill the bill at present, nor do soy beans. At the present time the natural growth of clover and trefoil seems to offer the best solution of the problem. In most wheat districts in New South Wales, especially on the heavy soils, trefoil and clover grow prolifically in the autumn, winter, and spring. Advantage should be taken of this growth to maintain the humus content. On the lighter soils where it does not occur to such an extent, it can be stimulated by the application of ½ to 1 cwt. of superphosphate per acre in the late summer. It has been found that where heavy dressings of superphosphate are applied to the wheat crop, or where an additional dressing of superphosphate is put on in the late summer, a great increase in the growth of clover occurs.

The best method to adopt is to burn the stubble as soon as possible, and then cultivate about 2 inches deep. If it is intended to sow superphosphate at this time as suggested for light country, the land can be worked with combine to make one operation of the cultivation and fertilising. The trefoil, clover, black oats, &c., germinate after such cultivation with the first autumn rains, and in the mild weather obtaining at that time of the year make rapid growth before the winter. Sheep are grazed on the land as required to use the feed available, and finally the sheep droppings and crop residue are ploughed in. In this way a considerable amount of nitrogenous material is returned to the soil, and, being nitrogenous, it eventually results in the formation of quite a considerable amount of humus The green growth could, of course, be ploughed in without being fed off, but it is preferable in every way to feed it off The sheep benefit, and most of the material is returned to the soil in the form of droppings and urine, and in this form it is easier to plough in and decomposes more quickly This system has much to recommend it. It means that a leguminous crop residue is returned to the soil without incurring any expense for seed or for ploughing. The only expense involved is the extra superphosphate and one shallow cultivation.

Experiments are being conducted to test the cumulative effect of heavy dressings of superphosphate on the humus content, and also to test the effect of various rotation systems.

Rotations.

The practice of growing wheat continuously or even alternatively with bare fallow is exhausting on the humus content. To maintain the soil at something approaching its original fertility, it is necessary to adopt a more

comprehensive rotation, and if possible one which gives prominence to the grazing of stock. The area of the holding, locality, soil, rainfall, and other factors must be considered in planning a suitable rotation. One that has much to recommend it and that can be profitably adopted on a wide range of farms is (1) wheat, (2) oats, and (3) bare fallow. This rotation is already becoming very popular in districts possessing a reliable rainfall.

The cost of producing oats on wheat stubble is very low, the demand for oats is increasing, and there are many different ways in which the crop can be utilised. The success of the newer varieties of oats produced by the Department has made it possible to profitably grow oats in many districts formerly considered unsuitable, and they are now being generally grown. Mr. D. Bolte, of West Wyalong, can be mentioned as one who has successfully adopted this rotation. To illustrate the rotation: Take a 1,000-acre property, 100 acres could be reserved for grazing, 300 acres would be fallowed, 300 would be under wheat, and 300 under oats each year.

To make it profitable to grow such a large area of oats, it is necessary to pay more attention to sheep—a development which is certainly in the right direction, if the maintenance of soil fertility is being considered. As full a use of oats as possible should be made for grazing purposes. Even after rather severe grazing in favourable districts oats can be depended on to produce fair grain or hay yields, and as much hay as is required should be cut, and the remainder of the crop harvested for grain. Oat silos for storing the grain (for rise in price or for feeding sheep) are desirable.

Where difficulty is found in utilising such a large area of oats, the system can be modified by only sowing half the wheat stubble to oats, the remainder being simply used for grazing.

In many favoured districts the introduction of other grazing crops should be considered. It is possible to grow grazing lucerne successfully over a large portion of the wheat belt, and wherever this is possible it should be done, as it is a practice that will maintain fertility. In the driest parts, where oats are not likely to be quite so profitable, a rotation of (1) wheat, (2) pasture, and (3) bare fallow has found favour, and is effectively maintaining the humus content of the soil, especially where clover or trefoil is encouraged to grow on the land during the pasturing period by heavy dressings of superphosphate.

Summary.

Any system of maintaining soil fertility must recognise the necessity for the immediate profitable utilisation of the land.

With the exception of phosphoric acid, the wheat soils of New South Wales are well supplied with plant-food and are not likely to be exhausted of any essential mineral.

The physical condition of heavy refractory clay soils can be greatly improved by the application of gypsum at about 1 ton per acre.

It is necessary to maintain the humus content of soils at a reasonably high level to continue to produce profitable yields.

Residues fairly rich in nitrogen are needed to noticeably increase the humus content; therefore cereal stubble is of very little use in this direction.

Stimulating clover and trefoil growth by dressings of superphosphate and long summer fallowing offer the best means of making leguminous residues available.

The adoption of a suitable rotation in which grazing of stock receives prominence is most valuable in maintaining soil fertility.

Winter Schools for Farmers, 1928.

Arrangements have been made for the annual Winter School for Farmers to be held at the Hawkesbury Agricultural College from 26th June to 20th July next. The syllabus covers a comprehensive course of lectures and demonstrations on agriculture, horticulture, live stock, &c., and, in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand, a special school will be held for those who desire to specialise in the subject of poultry-farming. All branches of the industry will be fully dealt with, and, moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers and youths over 16 years of age who have been engaged in rural work for at least one year will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of either sex over the age named who are engaged in poultry-farming.

Applications for both schools should be forwarded immediately.

The fee for either course, inclusive of board and lodging, will be £5 5s. Prospectus and full information may be obtained on application to the Under-Secretary, Department of Agriculture, Sydney.

Utilisation of Agricultural Wastes.

Whether or not you already know what lignin is and what it is for, you are likely to hear and learn more about it within the next few years. Lignin is a constituent of agricultural wastes, such as corncobs, cornstalks, and straw which in the past have almost been entirely wasted. Several years ago the chemists of the United States Department of Agriculture undertook to salvage some of the value of these by-products of the farms, and in the course of time evolved processes for the manufacture of furfural, which is now being used for many purposes. The Government discontinued the furfural experiments when commercial interests took over the work.

Lignin makes up from 20 to 30 per cent. of the dry material of these wastes. The chemists have succeeded in converting lignin into varnishes, dyestuffs, and various aromatic chemicals that give promise of finding their places in the commercial chemical field. "Lignin," says Dr. Browne, Assistant Chief of Chemistry and Soils, "may be called the greatest of all unutilised agricultural wastes, and it occupies with respect to industrial possibilities, the position held by coal tar a century ago."—*News Bulletin* of the Minister for Markets.

Farmers' Experiment Plots.

POTATO TRIALS, 1927.

Hunter River and Erina Shire.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE following farmers, in co-operation with the Hinton and Bolwarra Agricultural Bureaus, conducted potato trials during last season, viz., Messrs. N. S. Porter, Hinton; A. McKimm, Bolwarra; and S. O. Masters, Raworth.

Mr. J. Parry, of Terrigal, conducted a variety trial with the object of ascertaining the most suitable varieties for the Erina Shire.

The season on the Hunter was one of the most erratic ever experienced. The heavy rains during April thoroughly saturated the soil and subsoil. A dry winter followed, enabling the farmers to have the land thoroughly prepared for planting. The conditions at planting time were ideal, the weather holding fine, and the soil containing sufficient moisture to produce a good germination. Cold nights were experienced until mid-October, two unusually late frosts being experienced—one on 25th September, and a later one on 5th October. A good deal of damage was done in the district by these frosts.

The rain record shows that only 172 points of rain fell over the period from 1st July to 31st October. The prospects of obtaining a potato crop in the district looked very remote at the beginning of November, and a few farmers were harvesting with very poor results. The cultural methods employed by some farmers on the early lighter soils were beginning to show results, and some very fine crops were dug during early November.

Farmers who used fertilisers with the crop noticed that the plants were beginning to mature much earlier than the unmanured crops. With the advent of rain the backward unmanured plants made astounding growth, while the more matured fertilised plants were too far matured to make the same growth. The results were that in some cases, particularly in late planted crops, the unmanured plot produced a heavier yield than the manured. With early crops that matured in the usual natural length of time, fertiliser gave increased yields. The variety Factor showed out well in the trial, and should be more extensively grown in future seasons. Trades people are beginning to realise the excellent qualities of this variety, and are keen in their demand for it.

The Plots.

N. S. Porter, Hinton.—This experimenter conducted a variety trial planted in duplicate, one portion being manured with superphosphate at the rate of 2½ cwt. per acre, and the other unmanured.

The land had been well prepared, and was in ideal condition at planting on 3rd August. This experiment was not frosted, but suffered rather badly from the dry spring and cold nights. Harvesting took place on 8th December; two early maturing varieties (Starr's Satisfaction and Gold Coin) were harvested two weeks earlier, but as rain fell during those two weeks, the results from these plots are hardly comparable.

The results obtained indicate that even in a very dry season, providing good cultivation is carried out, increased yields are obtained from the use of superphosphate.

One of the objects of this trial was to popularise the Factor variety; also to test out the various strains of Satisfaction. A new variety, Gold Coin, was also included to compare with the standard varieties. Gold Coin established the reputation of being the earliest variety, but planted on the Hunter is a light yielder of excellent quality. The skin is white. Factor again produced the heaviest yield. J. Howard's proved to be the heaviest yielding strain of Satisfaction with Parson's, second. Both these strains produced a crop uniform in varietal characteristics, free from disease, and relatively free from "stringiness."

S. O. Masters, Raworth.—Two manurial trials were conducted with this farmer—one on a point of rich light alluvial loam, reputed to be the earliest locality in the district, and the other on heavier alluvial loam, banked off from flood reach and typical of a wide range of land in the district. Practically the same preparation was given to both plots. The original ploughing was carried out 10 inches deep with a disc plough, during the first week in June. The land was allowed to lie rough for a few weeks, and was then rolled and harrowed. Owing to the absence of rain no other cultivation was necessary until planting.

The variety used for an early planting experiment was Factor. Planting took place on 20th July, the seed being ploughed in 5 inches deep. The plot was subsequently harrowed. One portion of this experiment was frosted twice. However, the plants made excellent growth throughout, and were harvested on 29th November. The amount of rain which fell on this crop until November was only 182 points; however, good rains were experienced during November, these being of little value to the crop. The results of this trial clearly indicate that for this season the light application of superphosphate (2½ cwt.) was the most economical and produced the highest yield. This application of fertiliser produced an increase of 1 ton per acre, which, valued at the ruling price obtained, equals £13, the cost of the dressing being 15s. By doubling the application of superphosphate a reduction in yield was obtained, due to the dry season. The top-dressing with sulphate of potash also produced a decrease in yield. The poor results from M22 were due to lack of rain and the non-availability of the bonedust.

For an August planting experiment the variety used was Starr's Satisfaction. The method of planting was the same as for the early planting, and the date 4th August. On the heavier soil the cold nights prevented

much growth, and portion of the plots were frosted. The subsoil moisture does not rise in this soil by capillary attraction as quickly as in the lighter soils, the result being that the crop was very backward in growth until early November. Good rains fell during November and December, but the fertiliser had the tendency to ripen the plants off. This was particularly noticeable in the foliage. The unmanured plots did not have the tendency to ripen off, and produced new growth with the late rain. Even at the end of January these crops were not thoroughly mature. The maturing of the manured crops this season prevented the plants from taking full advantage of the late rains, hence decreased rather than increased results were obtained from the quicker acting fertiliser. The slow acting fertiliser, M22, however, had plenty of rain and time in which to become available, and a record crop of 14 tons 9 cwt. 1 qr. was produced. The 5 cwt. of superphosphate also had more time to become available and produced an increase over the plot to which 2½ cwt. were applied. An average of four manured plots produced a yield of 12 tons 19 cwt. 1 qr. Thus an application of 280 lb. of M 22 produced an approximate increase of 1½ tons, which, valued at the current rate of £4 10s. per ton, represents a gross increased return of £6 15s. per acre.

A. McKimm, Bolwarra.—These experiments were conducted on medium heavy alluvial soil, which was banked off from flood reach. The soil is very typical of the whole of the Bolwarra Flats, and the majority of the Hunter River potato country. The land had been particularly well prepared, and the potatoes were planted under ideal conditions on 2nd August. The germination throughout was good with the exception of Gold Coin, which came up very patchy. This crop was cut to the ground by late frosts. The soil being on the heavy side caused the capillary water to rise very slowly, hence the crops showed the lack of rain. The early varieties, especially those dressed with superphosphate in the variety trial, developed a reasonable crop, and started to mature before the November rains. With the advent of rains the unmanured and backward plots made outstanding growth, and continued to develop until well into January. On the other hand, the manured plots had started to mature before the rain, and did not make the same growth as the unmanured plots. It must be borne in mind that the past season was quite abnormal and the crops late. As the coastal potatoes are planted with the object of placing them on the early market, the tendency of the superphosphate to hasten the maturity of the plants would in a normal season be a distinct advantage. The manurial trial was planted with Factor potatoes, a variety maturing slightly later than Satisfaction. In this trial the superphosphate did not mature the plants before the rain owing to the lateness of the variety, hence comparable results were obtained. The unmanured plots averaged 7 tons 7 cwt. 3 qr., while 2½ cwt. of superphosphate produced 8 tons 5 cwt., an increase of 17 cwt. 1 qr., which, valued at £4 10s. per ton, equalled a gross increase of £3 17s. 7d. per acre.

In the variety trial the superphosphate produced decreases in yield owing to the reasons given above. However, a good deal of information was received as to the yielding qualities, &c., of certain selections of Satisfaction and other varieties. Satisfaction is the standard variety grown in the Hunter at present, and a good supply of pure seed is keenly sought after. The variation in quality and yield is surprising. This season Parson's Satisfaction produced top yield with 10 tons 10 cwt. 2 qr. per acre. The crop was very true to type, and free from virus diseases, and the variety should prove to be an excellent type for the Hunter. Howard's Satisfaction gave the yield of 10 tons 8 cwt., and was little inferior to the top yielder. Starr's Satisfaction proved to be the earliest maturing strain, and should do remarkably well in a dry or more normal season. The type is distinct, although a variation was noticed; very little virus trouble was observed. Gold Coin did not mature as early in this experimental plot as at Hinton. The variety produced very large potatoes. The Department cannot recommend this variety until more experience has been gained with it on the coast, and until a larger supply of seed is available.

MANURIAL Trials.

	S. O. Masters, Raworth						A. McKimm, Bolwarra.		
	Factor.			Satisfaction			Factor		
	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.
Superphosphate, 280 lb.	8	9	2	10	17	3	8	5	0
,, 560 lb.	8	5	0	12	11	2	....		
Superphosphate, 2½ cwt., top dressed with sulphate of potash at 1 cwt. per acre.	7	9	1	12	11	3	....		
P14, 373 lb. per acre	7	16	1	13	1	3	....		
P13, 373 lb. per acre	8	7	0	13	1	0	8	16	3
M22, 280 lb. per acre	7	15	1	14	9	1	7	19	3
P11, 326 lb. per acre	7	6	1	13	5	2	7	8	3
P12, 326 lb. per acre	....			....			8	3	1
No manure	7	9	1	12	19	2	7	7	3

P14 consists of 280 lb. superphosphate and 93 lb. sulphate of potash; P12 consists of 280 lb. superphosphate and 46 lb. sulphate of potash; P11 consists of 280 lb. superphosphate and 46 lb. sulphate of ammonia; P13 consists of 280 lb. superphosphate and 46 lb. sulphate of potash; M22 consists of 140 lb. superphosphate and 140 lb. bonedust.

J. Parry, Terrigal.—Potato cultivation is extending in Erina Shire, owing to remunerative returns being obtained by farmers. The light nature of the soil and the climatic conditions enable these farmers to place their potatoes on the Sydney market before any other district of importance. The crop responds well to artificial fertiliser, 280 lb. of M22 (equal parts of bonedust and superphosphate being used on the variety trial).

The soil on which this trial was conducted was typical sandy loam, and had been well prepared during the winter. To get the best results in this soil the sets should be planted about 5 inches deep, as the top few inches of

this soil becomes very powdery and dries out readily. The crops should be kept worked with the harrow to preserve the mulch and keep the weed seedlings down. After the rows are well up, intercultivation with the one-horse cultivator should be resorted to. Many farmers consider that hilling is one of the essential operations for successful potato culture. In this light soil hilling dries out the soil under normal circumstances and tends to reduce the yield. Only in cases where the potato moth is working freely or the tubers are showing out of the ground should hilling be carried out, and only then by means of light mouldboards attached to the cultivator.

VARIETY and Manurial Trials.

	A. McKimm, Bolwarra						J. Parry, Terrigal			N. Porter, Hinton					
	Superphosphate, 2¼ cwt. per acre.			No Manure.			M22, 270 lb. per acre.			Superphosphate, 2¼ cwt. per acre.			No Manure.		
	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.
Factor	8	5	0	7	7	3	7	1	1	5	1	2	4	7	1
Satisfaction ...		......			......		9	2	3		......			......	
Parson's Satisfaction.		......		10	10	2		......		4	4	0	3	14	2
G. Starr's Satisfaction.	8	3	3	10	0	2		......		2	17	2	2	8	3
J. Howard's Satisfaction.	8	19	3	10	8	0		....			......		3	18	0
Hillen and Leckie's Satisfaction.	6	2	0	5	19	2		.....		3	0	3	2	12	1
Gold Coin... ..	5	4	3	5	10	1		....		2	14	0	2	11	0
Early Rose ...		......			......		6	7	3		......			.....	
Up to Date ...		......			......		5	0	1		.....			......	
Early Manhattan		......			......		5	6	0		......			.....	
Early Manistee ...		......			......		6	1	3		......			......	

The present season's results favour Satisfaction as the heaviest yielding variety, with 9 tons 2 cwt. 3 qr. per acre. Factor, although yielding 7 tons 1 cwt. 1 qr., produced disappointing results when compared with Satisfaction. Under average conditions it is a much superior yielder to Satisfaction. However, one year's results cannot be taken as conclusive, the average over a number of years being much more reliable.

FOOD VALUE OF PRUNES.

WEIGHT for weight, dried prunes supply more body fuel than dried apples, milk, roast beef, eggs, or bread. This is chiefly on account of the high carbohydrate content, and I do not mean to say that prunes are a better diet than, say milk, for many other factors such as protein balance or ratio, digestibility, &c., must be taken into account. However, prunes are a highly nutritious food, and in addition they are laxative. Why not buy prunes instead of pills; the old saying, "An apple a day keeps the doctor away," might have added to it "Six prunes a night will starve him outright."—W. M. JOSEPHSON at Murrumburrah Bureau Conference.

Summer Fodder Crops.

Their Effect on Subsequent Wheat Yields.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

During the 1925–26 season a trial was instituted at Mrs. J. Berney's "Kildara," Eurimbla, *via* Cumnock, to test out the effect of summer fodders grown for grazing or silage purposes on land to be sown for wheat in the autumn immediately following. The results of that trial, which were in favour of the bare fallowed area, were published in the April, 1927, number of the *Agricultural Gazette.*

The trial was continued for a further year. An area of approximately 15 acres of rich, heavy chocolate loam of limestone origin was selected. Wheat was previously grown in 1925. It was disc-ploughed in February, 1926, 4 inches deep; again ploughed late in August, 5 inches, harrowed and disc-cultivated early October. Approximately 4 acres each were sown to Sudan grass and Japanese millet at the rate of 10 lb. seed per acre, mixed with 56 lb. high-grade superphosphate, sown through manure box on 9th October, 1926. The centre block was left as a bare fallow.

In spite of big rains on the prepared ground from March till September, aggregating 2,197 points, germination was very patchy, especially the Sudan grass. This cannot be accounted for, unless it was the presence of weeds, including saffron thistles and wild oats in large numbers. Dry conditions during October (33 points) and November (34 points) were not conducive to the rapid growth of the fodders, but 360 points during December brought what had germinated along well. This was fed off during the first week in January by 300 sheep, but did not provide fodder for any length of time. Decided preference was shown for the Japanese millet, which was eaten out quickly, and did not come again, but the Sudan grass, though only eaten after the millet was gone, gave better feeding results, and after a spell was again grazed in March. Generally the amount of summer feed provided by these crops was poor and not encouraging.

Owing to the light germination, it was not necessary to replough the ground in further preparation for wheat, and after good rains during April, 1927 (264 points), the whole area was scarified late in that month and sown on the 29th with combine, using 56 lb. graded Bena seed and 60 lb. high-grade superphosphate per acre. The effective rainfall on the growing crop was 468 points. The results are contained in the table below.

The 1927 results vary somewhat from those obtained the previous year. While apparently Japanese millet, which gave the best germination of the two summer fodders tried, has a retarding effect on the ultimate wheat yield, showing a difference of 1½ bushels in favour of the bare fallowed area

in a dry wheat-growing season, the plot sown originally to Sudan grass slightly outyielded the bare fallow. This may possibly be accounted for by the poor germination of the Sudan grass, which did not affect the fallow to any great extent.

The experiment is being continued for a third year.

Variety.	Season 1927. (Variety, Bena.)		Season 1926. (Variety, Waratah.)
	Area Harvested.	Yield per acre.	Yield per acre.
	acres.	bus. lb.	bus. lb.
Wheat after Japanese millet...	3·85	16 8	15 39
Wheat after Sudan grass	3·091	18 14	20 33
Wheat after bare fallow	2·433	17 42	23 29

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills ..	34	31 " 1928
E. P. Perry, Nundorah, Parkville (Guernseys) ...	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 " 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ..	70	16 " 1928
Department of Education, Mittagong Farm Homes ...	30	22 " 1928
Sacred Heart Convent, Bowral ...	11	23 " 1928
R. Burns, Wilga Glen Dairy, Coonamble ...	49	23 " 1928
Dominican Convent, Moss Vale ...	4	24 " 1928
Kyong School, Moss Vale ...	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	113	20 " 1928
Marist Brothers' Training School, Mittagong ...	80	25 " 1928
Blessed Chanel's Seminary, Mittagong ...	3	26 " 1928
Walaroi College, Orange ...	4	2 Sept., 1928
J. L. W. Barton, Wallerawang ...	16	11 Oct., 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	19 " 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital ..	16	8 " 1928
Department of Education, Hurlstone Agricultural High School	33	10 " 1928
Department of Education, Eastwood Home ...	16	16 " 1928
J. Davies, Puen Buen, Scone (Jerseys) ...	36	16 " 1928
Lunacy Department, Rydalmere Mental Hospital ...	63	25 " 1928
Lunacy Department, Callan Park Mental Hospital ...	20	26 " 1928
Miss Brennan, Arrankamp, Bowral ...	24	29 " 1928
H. Doggrell, Leicester Park, Mittagong ...	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School ...	34	12 " 1929
New England Girls' Grammar School, Armidale...	16	12 " 1929
A. E. Collins, Hazelhurst Dairy, Bowral ...	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes ...	16	14 " 1929
Lunacy Department, Kenmore Mental Hospital ...	99	17 " 1929
Tudor House School, Moss Vale ...	6	22 " 1929
Lunacy Department, Orange Mental Hospital ...	3	22 " 1929
Australian Missionary College, Cooranbong ...	57	24 " 1929

—MAX HENRY, Chief Veterinary Surgeon.

Early Tomatoes.

Production by the Ridge System.

A. J. PINN, H.D.A., Special Agricultural Instructor.

The growing of early tomatoes by the ridge system has been fairly general in areas cultivated by Chinamen, but in certain portions of the Murray River lands large areas have been planted under this system by European growers with fairly satisfactory results. It is contended by these growers that the system has advantages over the method more commonly known of training to a single stem on a stake, the chief of which is that one man can cultivate a much larger area and the returns per man are greater.

Probably the largest centre of production under this system is in the Koondrook-Barham district, on the border of Victoria and New South Wales, where the production of tomatoes during the summer of 1926 reached 90,000 bushel cases, exclusive of a large quantity supplied to the pulping factory. Large areas are also cultivated in the Echuca and Murrabit districts. In all these districts the rainfall is low and the crop is cultivated under a system of irrigation. The districts are by no means early ones, as heavy frosts are experienced during the winter months. It is claimed, however, that the system of growing on ridges and protecting with a combination of boards and bags offers protection to the plants against temperatures as low as 14 deg. of frost.

The aim of each grower is to plant and tend an area of 4 acres, which approximates 20,000 plants. Long hours and a good deal of effort are entailed. Should a grower succeed in planting the acreage mentioned, the covering up each night and uncovering in the morning of some 6 miles of tomatoes is necessitated in addition to the work of carrying water and weeding, &c., after the crop is planted. As against this, however, if a grower succeeds in producing a satisfactory crop, the returns are usually worth while, even though the earliest of the fruit may not realise more than £1 per bushel case. Yields of 600 to 700 bushel cases to the acre are common, in addition to tomatoes suitable for use at pulping factories.

Preparation of the Land.

The first essential in this system of cultivation is early preparation of the land in autumn, so that ridges of the necessary height can be formed with soil of a satisfactory tilth. The ridges are made at distances of 4 ft. 6 in. to 5 ft. from crown to crown, and with a height of approximately 2 feet. The method adopted is to " back up " with the plough, doing two rounds to each ridge. The home-made ridger (see Fig. 1) is then drawn twice along each clean-out left after the plough, the handles being held high for the first round and lower for the second. A good ridge is essential, and it cannot be made if the ground has not been given a thorough preparation beforehand. Low

ridges mean that the plants are set at a lower level in the ground, which usually results in less vigorous plants and very often in trouble from root and other diseases.

Fig. 1.—A Home-made "Ridger."

This implement is drawn twice along each clean-out left by the plough, the handles being held high for the first round, and lower for the second.

Fig. 2.—Boards in Position ready for Bagging.

With a 2-ft. ridge the plants would be set about half the distance up, which really represents the normal ground level. The balance of the ridge affords protection to the plants, which, when the boards and bags are in position,

are only exposed on one side, usually the northern. The ridges are run east and west, and with the plants on the northern face it will be seen that full benefit is obtained from the sun throughout the whole day.

Fixing the Boards and Bagging.

After the ridges have been made it is usual to prepare the "hole" for the position of each plant on the face of the ridge. This is done with a narrow

Fig. 3.—Bags in Position.

The two rows in the foreground show bags that can be let down over plants at night. It is said that this covering will protect plants down to 14 deg. of frost.

Fig. 4.—The Seed Frames.

type of spade, the operation consisting of placing the spade in the face of the ridge in a vertical position, pulling it slightly forward, and then withdrawing it. These holes are usually made 14 inches apart. The boards are then placed in position, one edge resting almost on the crown of the ridge, and the front supported by small stakes about 13 inches long in the

manner illustrated (see Fig. 2). The boards used are 10 inches wide and 1 inch thick; they are usually discards from the sawmills, and cost about 10s. per 100 lineal feet.

The next operation is to place in position the bagging, which is so spread on the board that sufficient overlaps for letting down over the front edge for protection of the plants (see Fig. 3). A little earth placed on the edge of the bagging at the crown of the ridge will hold it in position and affords protection from the cold on that side. The bags used are good quality, "once-used" Chapman sacks, free from holes; they are slit down both sides, thus producing a covering sufficient for about 6 feet of row.

Planting.

All is then ready for planting. Great care is taken in raising sturdy plants, which are ready for transplanting during July and August. Seed is sown from the end of April onward, and should be ready for transplanting into

Fig. 5.—A Close-up of the Plants under Board and Bag Covering.

seedling frames (see Fig. 4), from the end of May. These seed frames have no bottom heat, but a layer of old manure is placed under the surface soil chiefly to provide drainage. The frames are covered with glass, which is also covered with bagging at night for protection from frosts.

The manipulation of the glass frames requires some knowledge of the raising of plants so that they do not become "drawn." The aim should be to give as much air and exposure as weather conditions will allow.

Transplanting from the seed-bed to the frames is best done when the first spur root has formed. This is a somewhat thicker root than the early formed rootlets; it is produced just under the surface of the soil, and is pushed out from the main stem at right angles to it. Plants are set in the cold frames 3 inches apart in rows 4 inches apart, a planting board being used to make the small furrow in which the young plants are laid. The board is again requisitioned for lightly covering the roots, which are watered in with the aid of a

watering can. A man well up in the business can set up to 8,000 plants a day in these frames, but half this quantity would be satisfactory for a beginner.

As each plant has a space of 4 inches by 3 inches in the frame, good sturdy plants are produced, provided the proper attention is given to watering, ventilation, and protection; over-watering in the frames is likely to be a fault, as is also over-manuring. A good compost and soil mixture, with a little superphosphate mixed in the surface, provides a satisfactory medium for the young plants. Just previous to the final removal to the field they are well watered. Working long hours, one man can prepare the "holes," slab, bag, plant, and water-in up to one thousand plants per day.

In the preparation of the land previous to ridging, fertiliser is worked into the soil, and bonedust alone, or a mixture of superphosphate and bonedust, or that mixture with the addition of dried blood, is usually applied at the rate of 1 ton per acre for old land and ½ ton per acre for new land.

Fig. 6.—Another View of the Bags in Position.
When the plants are a fair size it is not necessary to cover them at night.

All early watering of the plants in the field is done by the use of a yolk and tip-cans. One can will do, on the average, about twenty-five plants. The chief aim seems to be to keep the surface soil around the young plant moist in order to encourage the development of new root growth. Plants set out in July seldom set fruit on the first flower bunch, but August plants usually do so. The plants are allowed to grow at will during the early stages, when it will be found that growth is chiefly to be seen in the leader and one lateral. The first lateral growth which breaks away is usually some distance from the base of the plant. Lower laterals will be noticed at the junction of the lower leaves and the stem, but these usually remain somewhat dormant during the early stages of growth. This is fortunate should a very heavy frost be experienced, as it is then found that damage is usually confined to the leader and first lateral growth. Should such a frost occur, the lower laterals

are looked to for new top growth. If no setback is encountered, it is found that a stage is reached when it becomes necessary to prune out these lower lateral growths, as only the leader and first lateral are required in the subsequent growth of the crop.

With the development of the young plants, growth is to the light on the northern side, and a time arrives when the letting down of the bagging at night will cause injury. The plants shown in Fig. 5 illustrate at about what stage the dropping of the bag covering must cease. It is at this stage that the covering flap of the bag must be raised (see Fig. 6). This is done by the use of longer stakes, which have a nail driven in the top end on which the bagging is fastened. In the Murray district this stage is usually reached about the end of August or early in September. Weed growth round the young plants may require a good deal of attention at this point, removal being effected by hand with the assistance of a small trowel or hand fork.

The board and bag coverings are left in position until about October, by which time it will be found that the plants have made growth towards the bottom of the ridges. It is then necessary to move the top growth in such a way that the foliage of one plant is over the base of the plant next to it. All is then ready for breaking down the ridges, which is largely accomplished by the use of a plough operated on the southern side of the ridge; where irrigation is practised a small channel is left alongside the rows.

The bulk of the tomatoes are harvested during November and December. The variety used is Chinese or Bendigo Large Red or strains of this variety, which appears to set fruit under cooler conditions than most others It is a good carrier, but cannot be considered of a good type, owing to its shape. Being thick in the skin, it is suitable for sending a long distance to market which, in the case of the Murray River growers, is Melbourne. Quite recently a party of growers from the area mentioned visited the central coast districts of New South Wales with a view to selecting suitable localities for the growing of the crop under the system described. They stated that the large increase of glass-house tomatoes from Adelaide is seriously influencing the prices realised by their later crop. In view of the milder winter conditions ruling in the coastal districts of this State, they are of the opinion that earlier crops of fruit will be possible than in their present situation, the fact also appealing to them that a good market is close at hand.

It is rather a reflection on our average dairy cow that Melba XV of Darbalara gave, in the eleventh month of her lactation period, a greater quantity of butter-fat than the average cow does in a year. The average cow might reasonably reply that she was not allowed to choose her parents, and that her owner is less generous as to her diet than the breeder of the champion mentioned, and less punctilious as to her general care.

Farm Forestry.

IV. The Establishment of Windbreaks, Shelter Belts, and Tree-lots.

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

The desirability of windbreaks, shelter belts, and tree-lots from the point of view of efficiency in farm management has been discussed in detail in a previous article. If the farmer or pastoralist has decided to establish any of these features, the success of the work depends largely on the adoption of correct methods and planting plans. It has been previously pointed out that success in tree-planting work is based on a number of factors, including choice of suitable species, procuration of good stock, preparation of the ground, careful planting methods, and subsequent protection of the young trees. Attention to such details means successful establishment and growth of the individual trees, but the efficiency of a break, shelter belt, or tree-lot depends also on its collective character, and the relationship of the individuals composing it one to another. Mode of formation and planting plans are therefore of equal importance to care of the individual trees, as it is as a collective group that windbreaks and shelter belts perform their functions.

Windbreak and Shelter Belt Formation.

The object of these formations is to protect the largest possible area from the effect of injurious or unpleasant winds. This result is secured by the planting of a row or belt of trees at right angles to the direction of the wind against which protection is sought. Both the efficiency of the break and its landscape effect are increased, however, if it be placed somewhat obliquely or curved, instead of strictly at right angles to the direction of the wind. The selection of a site is often so limited by the needs of the locality that there is practically no choice in the matter. For instance, in a fenced paddock containing field crops or fruit trees the site is confined to that fence which is most nearly at right angles to the prevailing wind. Where stock are to be protected, however, the choice of a site is much more varied, as the shelter belt need not necessarily be placed along a fence line, but anywhere within the paddock itself.

In many districts destructive winds may come from more than one quarter, so that where only one belt is being planted a choice must be made as to which wind is the more harmful. Generally speaking, in New South Wales the most violent and destructive winds come from the west and south-west, so that the windbreak will run from north-west to south-east, or from north to south. Hot, drying winds and cold, raw winds often come from the same quarter, according to the season, but at times a choice must be

made as against which type protection must be established. The choice will vary with the subject to be protected, as bleak winter winds are generally more harmful to stock, and hot, drying winds more damaging to crops.

The most common fault with windbreaks is that they are too open for efficient protection, but it should also be remembered that an absolutely dense and impenetrable windbreak, apart from being difficult to attain, is undesirable. The break should let a little wind go through. This slight movement of air through the break forms a cushion, both on the leeward and windward side, of more slowly moving air which deflects the main volume of wind upwards and prevents it from descending for some distance. On the other hand, if the break be impenetrable, the wind will describe a somersault over the obstacle, ascending violently on the windward side and dropping quickly and strongly on the leeward side, providing practically no shelter except in the immediate vicinity of the break. Further, complete stagnation of the air is undesirable from the point of view of fungous diseases and frost injury.

Speaking generally, windbreaks and shelter belts may be grouped, according to the purpose of planting, into four types—

1. Shelter belts for stock;
2. Windbreaks for protecting orchards or other cultivation fields;
3. Protective breaks for homesteads or houses;
4. Shelter belts surrounding plantations of species liable to wind damage.

Shelter Belts for Stock.

Unlike breaks for crops or orchards, considerable latitude usually exists in the choice of a site for a stock shelter belt, as it may be situated practically anywhere within the paddock. Planting along the fence lines is often the method adopted, as the existing fence already provides protection on one side from damage by stock, necessitating the erection of only one new fence. In large paddocks, however, the shelter belt is best situated somewhere out in the centre of the paddocks, as stock have access to all sides of the belt, and can thus secure protection from all winds. On large areas such belts can be planted along ridges or on the top of small hills, and sites can be chosen which are not producing the best pasture grasses, but which are suitable for tree growth.

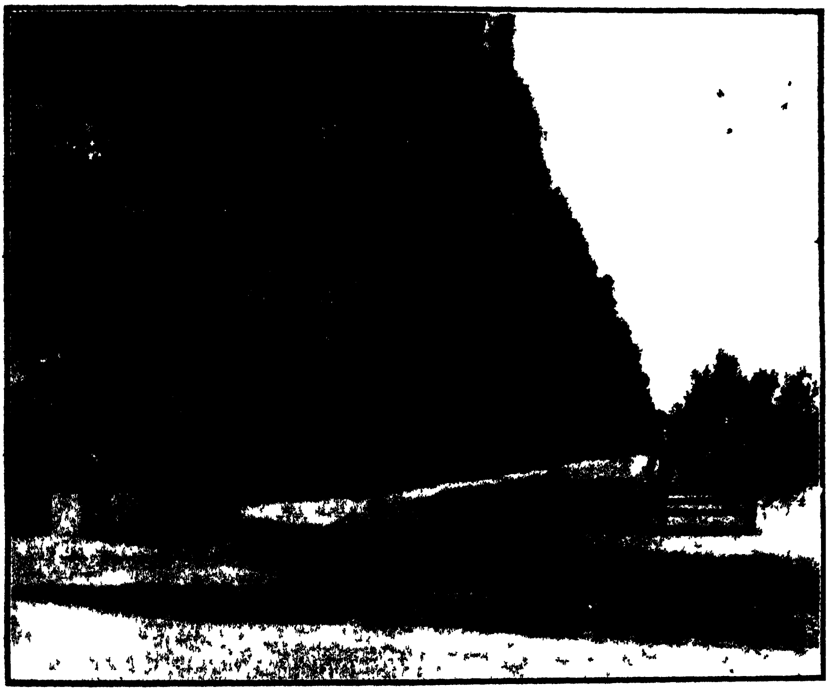
The shelter belt may be straight, crescent-shaped, or two belts may be arranged in the form of a cross. The last-mentioned shape is particularly effective, as it gives shelter over a fairly large area and from every quarter. Stock shelter belts are different from those of crop breaks, as the former are required to give shade as well as wind protection. Slight modifications are then necessary, so that protection against winter winds is combined with summer shading. Where space permits, the stock shelter may take the form of a tree-lot, thus securing the dual purpose of shelter and timber supply.

Where the four corners of adjoining paddocks meet, a clump of trees may be planted at the fence intersection which will give shade and shelter, and which will occupy land presenting difficulties for ordinary crop production.

Similarly, a few shelter or shade trees can be planted with advantage in all V corners of the paddocks. Such corners are difficult to plough, and are often the cause of injury to stock.

Crop and Orchard Windbreaks.

Speaking generally, windbreaks for crops and orchards are more limited in scope than those for stock. Land is generally more valuable, so that only a narrow strip can be spared for windbreak work, and that strip is necessarily limited to the boundary of the orchard or paddock which is most nearly at right angles to the direction of the prevailing wind. Where



A Eucalypt Windbreak Sheltering a Californian Orchard.

Australian eucalypts are largely grown in California for both shelter and the production of timber

ground is valuable, the break will be limited to a one- or two-row formation, but where possible, the multiple-row break should be employed. The strip of land to be allowed the windbreak may be calculated at from one and a quarter to twice the height of the trees employed, so that for a break 50 feet in height, fruit trees should be planted at not less than about 30 to 40 feet from the nearest row of the windbreak. The selection of species is also much more limited than that for stock shelter belts, as only those trees with deep-rooting tap roots and which rob as little as possible adjoining soil should be used.

Homestead Shelter Belts.

Shelter belts about the homestead serve a dual purpose. They increase the comfort of the dwelling, making it a much more pleasant place to live in, and also provide an attractive setting or background for the buildings. They may also be used for screening off unsightly buildings, stock yards, &c.

Very little attention is usually given to the planning of the homestead and its surroundings, but consideration of the needs of the locality, combined with a proper planting scheme, would add considerably to the comfort of the one and the benefit of the others. For instance, where ground is not expensive, a 5-acre tree lot of 20 by 40 rods could be planted on the western side of the homestead. This would not only cut off the bleak or hot westerlies, but would form a source of timber supply for all farm needs, apart from the picturesque effect it would give to the holding. Along the southern side a shelter belt could be planted of one or several rows of trees, according to the ground available. The orchard and vegetable garden could be located within the protected area.

Such belts should not be planted too close to the house, as the trees would unduly shade the buildings during the winter months, fire risk would be increased, and tanks and drains would be blocked up by leaf litter. Further, close planting tends to spoil the individuality of the homestead building, more distant planting providing a much more effective background. The nearest shelter should be not much less than 100 yards from the dwelling, the intervening ground being planted with individual shade and ornamental trees if so desired. Planting too close to dairy or stock yards is particularly undesirable as the shading in winter makes them wet and sloppy.

Breaks for Plantations.

Some trees which provide valuable timber or are especially desirable, are very liable to wind damage, so that an outer protective row or belt of wind-hardy trees becomes necessary. In the case of the farmer, however, the establishment of such a plantation is not likely to be undertaken, but where tender or shallow-rooted species are particularly desired or are of especial value, some provision must be made in the way of protective breaks.

In parts of the tablelands the Californian redwood (*Sequoia sempervirens*) will make good development if grown in a sheltered position. The lemon-scented gum (*Eucalyptus citriodora*) is another species which often requires some protection. In the western districts a protective break or belt of hardy shrubs and trees will frequently permit the development of less hardy trees within the protected area.

Types of Windbreaks.

Having considered windbreaks and shelter belts in relation to the purposes they serve, it should be noted that they may also be conveniently classified according to the method of formation. Such a classification would include the following types:—

1. Single-row type.
2. Double or multiple-row type.
3. Grove or tree-lot type

Single-row Type.—The single-row windbreak should only be employed where land is so valuable that only a small space can be spared for protection work. It also serves a useful purpose when used as a supplementary break to the main shelter belt of the multiple-row type. For instance, the main belt may be situated on the western side of a series of paddocks with single-row breaks along the fences of the several paddocks. Where only the single-row type of windbreak can be planted, care must be exercised in choosing only those species which retain their branches to the ground, and which make fairly dense growth. Conifers, such as *Pinus insignis,* are especially suited for this purpose, but other species, such as the turpentine, are

A Six-year-old Windbreak of Turpentine (*Syncarpia laurifolia*)
This species is very suitable for windbreak formation, having a habit of growth and harbouring few insect and fungous pests

also useful. The chief drawback to the single-row type is that the failure of one tree in the break seriously affects the efficiency of the whole, whereas, in a several-row break, the dying out of one or two trees is not so detrimental. Trees, moreover, make the best growth when grown in communities, but the single-row break, if carefully planted with the right species, is often very effective.

Double or Multiple-Row Type.—The most effective type, however, is where two or more rows are planted. This permits the employment of several different species of varying height growth, so that the density of the break from top to bottom is more uniform. A windbreak consisting of more than one species is usually the more effective. The ideal windbreak should have more or less the contour of an earth mound with the tallest trees in the centre and graduating down to low, shrubby species on either side This

is particularly the case where the wind comes from more than one quarter; but where the break is designed to protect from one direction only, the formation may be so arranged as to place the shortest trees on the outside row towards the prevailing wind, the medium-sized trees in the central row, and the tallest on the inside. Both types have the effect of deflecting the wind current upwards and over the protected area.

A two-row break may consist of a row of conifers on the inside with a row of eucalypts on the outside. A three-row break may be formed of a central row of eucalypts with a row of conifers, or other densely growing or compact species, on either side.

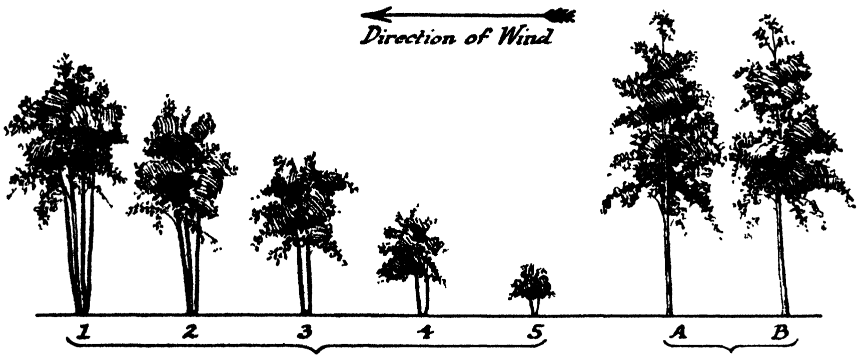
A seven-row break is probably the ideal one from the point of view of protection. For instance, in the cooler parts of the State an effective break would consist of three central rows of the Tasmanian Blue Gum (*Eucalyptus globulus*) with a row of *Pinus insignis* on either side of those and a row of cypress occupying the edge of both sides. An effective break which also combines with it some of the usefulness of a tree-lot can be made by planting seven rows of eucalypts. These are allowed to grow until well established as fair-sized saplings, the period necessary for such growth being about six to seven years. The inside row is then cut at ground level and allowed to coppice. Each succeeding year a row is cut, until at the end of seven years the whole of the break has been cut over. In the meantime the coppice growth from the first year's cut has established itself and grown to such a height as to make an effective break. By such a method the effectiveness of the break is maintained, and at the same time a regular supply of small timber and firewood is obtained. Successive cuttings have resulted in successive height growths of the coppice, the varying heights making for a more uniform density in the break and a sloping contour towards the direction of the prevailing wind.

Grove or Tree-lot Type.—In calculating the value of windbreaks, it is necessary not only to consider the benefits of protection, but the value of the timber grown. In a single-row break the timber (being very knotty) is of poor quality and suitable only for fence posts and very rough work. Where its protective value is very high, however, as in the case of homesteads and valuable crops such as orchards, the value of the timber may be disregarded. A combination of protection and good quality timber can only be secured in the broad belt or grove. The farmer, however, may not have the ground available for such work as he may consider it too valuable for timber production. The amount of space which can be devoted to such purposes depends on a number of factors, but the planting of wide belts is only justified where the combined protective and timber value is at least equal to the value of crops grown on the same area. The method of establishing a grove or tree lot will be dealt with later.

Spacing.

As mentioned in a previous article, spacing in windbreaks is necessarily wider than that of plantations for timber, as lateral development of branches is required in the former and not in the latter. Spacing, however, must not

so wide that the tree will make the same development as if growing in the open by itself. Spacing naturally varies considerably with the species employed. Tall growing species with little lateral development, such as some of the poplars, require as close a spacing as 4 to 5 feet, whereas wide spreading species, such as willows, require very wide spacing. More exact information will be given when dealing with the recommendation of species for different districts, but it may be stated that, generally speaking, in breaks consisting of more than one row, conifers should be planted about 10 feet apart, and eucalypts about 12 to 15 feet apart in the rows, the rows themselves being the same respective distances apart. Closer or wider planting varies with local conditions and requirements. Where more than one row is employed, the planting should be triangular, the second row being planted so that the trees come opposite the centre of the space between the trees in the first row.



A Seven-row Windbreak of Eucalypts.

The sketch shows the method of coppicing suggested; it not only yields fuel and timber for small purposes, but makes an effective break.

Rows 1 to 5 have been coppiced, one row at a time in successive years in the order of numbering. Rows A and B are original trees, which remain to be coppiced.

Preparation of the Ground and Planting.

These subjects have been dealt with in detail in a previous article. As regards their application to windbreak formations, it should be remembered that careful preparation of the ground is absolutely necessary for the success of the project.

The sapping effect of a single-row break, especially where it is to be used to protect an orchard or crop field, can be considerably reduced by deep ploughing in order to encourage deep rooting. Careful preparation of the ground and after cultivation are also necessary, especially for the single-row type, in order to ensure a successful and uniform growth of all trees, as gaps here and there caused by losses make the break both unsightly and less effective. Because of the function they perform, the trees composing any type of break are invariably in a position of great exposure and subject to adverse conditions right throughout their lives. It becomes necessary,

therefore, to counteract such difficulties as far as possible by thorough preparatory work and subsequent care for the growing trees. Where stock are present, it is absolutely essential to fence off the windbreak and protect it from animal invasion, especially during the first few years of growth. If any failure occurs among the young plants the blanks should be filled immediately or as soon as conditions are favourable for planting.

Roadside Planting.

On many country roads the amount of reserve is fairly large, so that the actual roadway occupies only portion of the whole width. The native trees have generally been left standing along the margins, but they are often only scattered, and, in many cases, reduced to a ragged line of isolated

A Country Road on the North Coast.
Many such roads offer scope for marginal planting, which has both utilitarian and aesthetic value.

individuals by the inroads of settlers in search of fuel and fencing material. Regeneration by natural means is practically impossible owing to the destruction of young growth by passing animals. On the other hand, one is sometimes surprised by a pleasant roadside avenue of indigenous trees which not only add to the beauty of the district, but act as shelter belts and windbreaks for adjoining paddocks.

Where roads are sufficiently wide and satisfactory tree growth is absent, planting along the fence lines has many advantages. No encroachment is made on the ground space of the farmer's area, and yet benefits of wind protection and shelter for animals are provided. The trees provide a certain amount of protection as firebreaks, add to the comfort of travelling stock, and beautify the landscape. For shelter belt purposes there is the possible

disadvantage that the direction of the roadway may not be the best direction for planting to obtain shelter. In some cases, for example, it may run in the same direction as that of the prevailing wind, instead of at right angles to it, but in a big percentage of cases roadside planting will provide satisfactory shelter. Such plantings are, of course, subject to the approval of the local Shire Council, but any operation which adds so much to the appearance of the district is bound to receive favourable consideration.

Roadside planting has benefits for the individual adjoining the road, for passing travellers, for the community generally, and is a subject which deserves serious consideration, especially in those districts where there is a live community spirit and an appreciation of the advantages of co-operation. For a start plantings may be restricted to the main roads of the shire, and, apart from the efforts of the individuals adjoining such roads, the local councils and progress associations could lend their support to a scheme which would reflect credit on their enterprise and add to the attractiveness of their districts. In some cases interference with telephone lines would have to be considered, but usually such lines could be avoided.

A roadside planting scheme with the object of making an Australian avenue from Sydney to Canberra has been initiated by the Forest League, and the co-operation of other bodies is being sought. The idea could be extended to shorter lengths of roads throughout the State.

(To be concluded.)

Why Men Do Not Conserve Fodder.

In the past men conserving fodder for droughts have found it highly profitable. Why are such men fewer in number to-day? Firstly, because labour conditions and machinery prices have made production costs so high, that, with risks considered, the business has much less attraction. Secondly, the possibility of the launching of the frequently promised national scheme makes even more uncertain the anticipated profits, which alone will induce either the individual or a company to take on the business; consequently the hay cut has become so reduced as to make one apprehensive of the next drought. In spite of difficulties the interests of the industry demand action, and every sound available method should be developed without delay.—H. K. Nock at Forbes Bureau Conference.

The Problem of Agricultural Credit.

There is very little joint stock in agriculture. It consists of a number of relatively small enterprises, the success of which depends on there being adequate agricultural substitute for the industrial joint stock methods of obtaining working as well as initial capital. This is the problem of agricultural credit.—D. H. McGregor, in "Final Report of the Agricultural Tribunal of Investigation."

Onion Trials in 1927.

(1) ON FARMERS' PLOTS.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

ONION growers in New South Wales have, with very few exceptions, just passed through the worst season on record. The unsettled weather early in the year in the onion-growing districts prevented the thorough preparation of the soil. On the coast, where the seed is planted direct in the field, rainy weather prevented the early sowing from being carried out, and the flood rains of April, 1927, totally destroyed the majority of the stands. The heavy rains consolidated the soil, destroyed the mulch, and threw the soil out of condition for replanting. One of the driest winters on record was experienced, with very heavy frosts, which retarded the growth. Very light showers were experienced in the spring, but no rain of any quantity fell until November. In the majority of cases this was received too late to be of any value, and many farmers planted the onion beds with potatoes during August. This practically reduced the area, particularly on the Hunter River, to a minimum.

Growers in the western areas around Dubbo and Wellington were not so inconvenienced by the early wet weather, as the seed in these districts is planted in seed beds. However, the winter was the most severe on record, being dry and very frosty. In several localities the frost very severely damaged the onion plants. Even with irrigation the crops showed very little growth and with the continuation of frosts and the dry weather until November, many crops failed.

Experiments were carried out in the chief onion-growing centres of the State, but owing to the adverse season all but two of these trials failed.

Hunter River Experiments.

The only experiment to produce a crop on the Hunter River was a manurial trial conducted in co-operation with Mr. A. McKimm, of Bolwarra. The previous crop planted on this land was potatoes. The land was ploughed with a mouldboard in November, 1926, and fallowed until planting, which took place on 28th April, 1927. The seed was sown direct in the field in rows 10 inches apart, after the manure had been broadcasted on the plots.

Heavy rains were experienced just after planting and caused a faulty germination. A dry, cold winter followed, resulting in very poor growth and yields. Harvesting took place on 15th December, 1927.

The result of the trial is very unsatisfactory owing to the nature of the season, the two outstanding plots being those treated with P3 and P7.

	tons	cwt.	qrs.
P7, 378 lb. per acre	3	7	2
P3, 672 lb. per acre	3	7	2
M13, 546 lb. per acre	3	7	0
W3, 364 lb. per acre	3	4	3
Superphosphate, 420 lb. per acre	3	4	3
Basic superphosphate, 476 lb. per acre	3	2	0
M3, 546 lb. per acre	2	19	2
No manure	2	16	3

The fertiliser mixtures mentioned are made up as follows :—

P7, 1 part bonedust, and 1 part superphosphate.

P3, 3 parts sulphate of ammonia, 10 parts superphosphate, and 3 parts sulphate of potash.

M13, 10 parts superphosphate, and 3 parts sulphate of potash.

W3, 2 parts bonedust, and 1 part superphosphate.

M3, 3 parts sulphate of ammonia, and 10 parts superphosphate.

Experiments at Dubbo.

A small variety trial was conducted in co-operation with Mr. E. Gordon, of Dubbo, with the object of ascertaining the most suitable variety to grow in the west. The seed was sown in seed beds and later planted out between trees in the orchard. This crop suffered severely through the adverse season, and the results, therefore, cannot be taken as conclusive.

Odourless again proved to be the best yielder, but it is a bad keeper and unsatisfactory as a commercial variety; however, it can be recommended for home use. The bulbs are large, uniform in size, and very mild in flavour. The Hunter River Brown Spanish again proved to be the best all-round variety. A strain selected at Dubbo by Mr. C. J. Rowcliffe, over a number of years proved to be the best yielder.

	tons	cwt.	qrs.
Odourless	6	18	0
H.R.B.S. (C. J. Rowcliffe)	6	14	0
Silver King	6	9	3
Early Victorian White	6	4	1
H.R.B.S. (A. McKimm)	5	18	1
Early Barletta	5	18	0
H.R.B.S. (Department of Agriculture)	4	17	3
Light Skin Brown Spanish	3	4	3

(2) BATHURST EXPERIMENT FARM.

R. THOMSON, H.D.A., Experimentalist.

A trial of onion varieties was carried out this season to determine the suitability of certain varieties to the district.

The seed was sown in beds on 21st March. A good germination resulted in all cases and growth was good. Planting out did not take place until 2nd August, being delayed by prolonged dry frosty weather. Most crops planted in the district before this date were lost. Rows were spaced 15 inches apart, plants 8 inches in the rows.

The land was in fair order, although rather dry and cloddy for the best results. Fertiliser, consisting of equal parts of superphosphate and blood and bone, was applied broadcast at 3 cwt. per acre a week after planting and chipped in.

The soil was an improved granite loam.' Summer cabbages had been grown during the season 1926–27, and the residues were cleaned up during March and the land ploughed, fallowed during winter, ploughed again before planting, and then harrowed.

Growth was good. The crop was irrigated twice during the first month, and from then on it grew on the rainfall. Good rains were not experienced until late in the spring. The weather was very changeable, cool spells frequently retarding the growth. Heavy rain fell when the crop was ready to harvest and spoiled the quality.

Towards the end of October the plants commenced to form bulbs, the lateness in planting out keeping the crop back right throughout the season, and even the most forward of the varieties not being ready for the early market. The crop was harvested early in January when the tops had died down. All varieties sent up seed heads, the worst being Prizetaker and H.R.B.S. (Agricultural Department).

The yields were as follows :—

Variety.	Yield per acre.				Date of Maturity.
	tons	cwt.	qr.	lb.	
Odourless	7	14	3	14	22 Dec.
Prizetaker (Tarrant)	6	7	2	0	27 ,,
Silver King	6	5	0	0	27 ,,
Redgrave's Brown Spanish	4	16	1	0	24 ,,
Pera	4	7	2	0	28 ,,
H.R.B.S. (C. J. Rowcliffe)	3	18	3	0	2 Jan.
H.R.B.S. (A. McKimm)	3	8	0	14	28 Dec.
H.R.B.S. (Agriculture Department) ...	3	6	1	0	28 ,,
Early Barletta (Agriculture Department)	2	7	3	14	15 ,,
Lord Howe Island	2	6	1	0	20 ,,
Early Barletta (Commercial)	2	4	0	14	18 ,,

Notes on Varieties.

Odourless.—Large, round, and fairly flat; very thin neck, slight depression; skin light brown, thin and papery; cut surface shows tinge of green; flesh good quality; juicy; flavour very mild.

Prizetaker.—Large, round, and fairly deep; medium neck; slight depression; colour varied; purple and brown predominant; skin tough; cut surface shows purple colour; texture poor; flavour strong; a very mixed strain, but offers good material for improvement.

Silver King.—Size uneven, 2 to 4 inches; very flat; hollow underneath; neck fairly thick; skin white and fairly thin; cut surface white; close texture; flavour hot.

Redgrave's Brown Spanish.—Size medium; shape uneven, from flat to round; neck thin, skin thin, shells off easily; colour medium brown; cut surface shows slightly green; texture open; flavour fairly strong; best yielding brown strain, but of poor quality.

An Onion Crop, showing a number of Plants Running to Seed-heads.
This defect may be due to (1) a dry season; (2) too-early planting; (3) "run-out" seed.

Portion of a Crop of Onion Seed.

Pera.—Small, about 2 inches; shape rounded, somewhat conical; medium thin neck; colour dark tan; skin tough and very tight on onion; cut surface white; close texture; flavour medium strong, sweet; this variety had a tendency to produce two or three onions in the one skin.

H.R.B.S. (C. J. Rowcliffe).—Size, 2½ inches, shape round, fairly deep, thin neck, slight depression; colour, medium brown, little purple; skin, papery and inclined to peel; cut surface inclined to purple; texture fairly close; flavour strong. This is the most even brown strain.

H.R.B.S. (A. McKimm).—Size small, shape round and fairly deep; thin neck; colour pale brown, with fair proportion of purple; skin papery; cut surface white with purple tinge; texture close; flavour medium.

H.R.B.S. (Agriculture Department).—Size good and even, 3 inches; shape round and deep, neck thin; no depression; colour medium brown, a few purple; skin thin and tough; cut surface slightly purple; texture good; flavour fairly mild; a firm hard onion of a very desirable type.

Early Barletta.—Size very uneven, 1 to 4 inches; shape round and flat, neck thin; colour white; skin fairly thick, cut surface white; texture rather open; flavour medium strong.

Lord Howe Island.—Size 2 to 3 inches; shape round, medium, flat; neck very thin; no depression; colour dark purple; skin thin and tough; cut surface purple; texture spongy; flavour very hot.

Early Barletta (Commercial).—Similar to Departmental strain, but very uneven.

Of the varieties under trial this season, Odourless was the most outstanding A fairly early onion of very attractive appearance and quality, it should prove a serious rival to the white strains on the early market. Of the brown varieties the Department's strain has the best quality, followed very closely by A. McKimm's.

Prizetaker offers great room for selection and improvement, some exceptionally fine onions being present.

(3) COWRA EXPERIMENT FARM.

R. N. MEDLEY, H.D.A., Experimentalist.

A variety trial was conducted at this farm last season. The plants were transplanted on 28th June, being spaced 4 to 6 inches apart in rows 3 feet apart. The dry season was not favourable, and the crop did not yield as was expected, though irrigated occasionally. Harvesting was carried out on 22nd December, the bulbs being of fair quality only, and uneven in size and shape. The following yields were computed from rows half a chain long:—

	t.	c.	q.	lb.
Odourless	6	9	2	16
H.R.B.S. (Agriculture Department)	5	8	0	4
H.R.B.S. (C. J. Rowcliffe)	5	3	3	24
Early Barletta	4	8	1	16
H.R.B.S. (A. McKimm)	3	19	2	16
Pera	3	0	3	16

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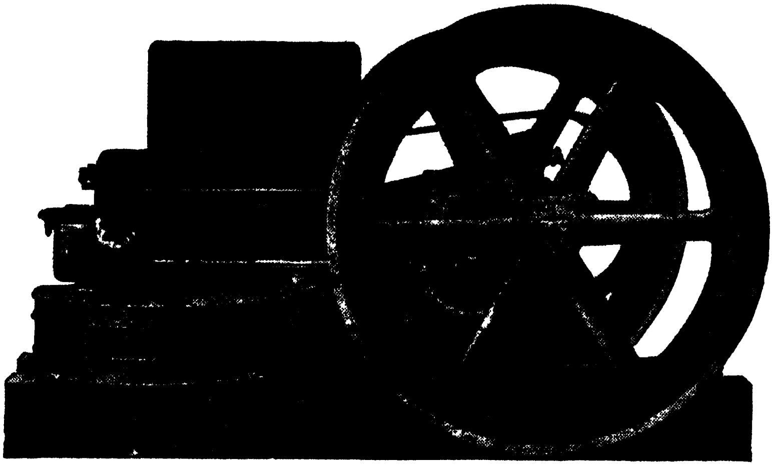

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5	450	8 x 5¼	535	5	6½	24	42	26	21½
7	400	10 x 6¼	775	6	7½	28	49½	29	25
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Improved Pastures for Sheep.

J. N. WHITTET, H.D.A., Agrostologist.

THE work of pasture improvement is uppermost in the minds of many pastoralists at the present time, as landholders are anxious to increase the carrying capacity of their holdings, and with this end in view extensive areas of winter grasses and clovers have been planted during recent years.

During the past six years, the area which has been sown with grasses in New South Wales has increased from 1,500,000 to 2,000,000 acres. As the result of trials carried out by the Department of Agriculture and the hearty co-operation of farmers and pastoralists in placing at our disposal areas of land for experimental purposes, we are now in a position to make definite recommendations regarding the best varieties of grasses and clovers to plant, and the most satisfactory fertilisers and the quantities of same to apply as top-dressings.

The sowing of pastures has proceeded hand in hand with top-dressing, and the value of lucerne has been demonstrated, not only in districts of heavy rainfall, but as a grazing proposition in average wheat districts.

In periods of drought, when the natural pastures have been practically useless, large areas of lucerne on typical wheat land have carried up to two sheep per acre. In parts of the Tablelands and the Slopes, where the country is too rough for lucerne, Subterranean clover has given good results. Maximum results can only be secured from this clover by top-dressing it with superphosphate.

Nourish the Pastures.—By providing the grasses and other pasture plants with food in the shape of fertilisers, the quality of the herbage is greatly improved. The use of superphosphate stimulates the growth and seed production of legumes, which are extremely valuable plants in a pasture. The amount of mineral matter in the grasses and clovers is also increased, particularly the elements lime and phosphorus, which are essential for the animals' health and development. Where there is a marked increase in the lime content, the percentage of nitrogen present in the pasturage is also increased.

The main reasons, therefore, why sheep prefer top-dressed to unmanured portions of a paddock are that:—

1. The percentage of mineral ingredients is higher in the former, and the animals' needs for such substances as lime and phosphates are being supplied.

2. The top-dressed pasture is more palatable and contains a greater amount of protein, due mainly (*a*) to the increased growth of clovers, (*b*) to the increased percentage of nitrogen present in the pasturage as a whole.

An ample supply of protein is most important, as this is the chief supply of nitrogen available to the animal. Protein is required for the production of flesh, blood, muscles, tendons, ligaments, brain matter, wool, horns, hoofs, etc. Young growing animals, females producing and rearing young, and animals being prepared for mating, require feed which is well supplied with protein, in order that they may function properly. The amount of fertility removed from the soil by sheep grazing on pastures, corresponds to the quantity of the marketed product, whether it be wool or mutton, or both, and to make up for this withdrawal, the material should be returned to the soil in some other form.

It will be seen, therefore, that by nourishing the pastures through the application of fertilisers, not only is the quantity of feed increased, but a considerable gain in the nutritive value of the plants takes place. The universal use of superphosphate as a top-dressing for pastures is mainly due to the following facts:—

1. It stimulates the growth of leguminous plants, such as clovers, which are particularly relished by stock on account of their palatability and high feeding value.
2. It encourages the growth of most of our palatable introduced grasses, and also many of our rapid-growing, nutritious native species.
3. It is an economical fertiliser to use, and the residual effect is apparent for more than one season.

Top-dressed pastures remain greener and consequently are more palatable to stock than unmanured areas, and by not drying out readily the danger from bush fires is lessened.

Districts where Top-dressing is Mainly Carried Out.—As a result of the trials at experiment farms and on farmers' and graziers' holdings having proved a success, this particular phase of pasture improvement is being adopted, and superphosphate is being applied on a large scale as a top-dressing to pastures in many of the wool-growing centres. This is particularly the case on the Tablelands, in the Riverina, on the Slopes, and parts of the Plains, where applications of from ¾ to 1 cwt. of superphosphate per acre every second year are being made. From particulars obtained by the distributors of fertilisers it is interesting to note that most of the fertiliser sold for the top-dressing of pastures in sheep districts has gone to the South-western Slopes and Riverina, and the Southern Tablelands.

Clovers and Superphosphate.—The residual value of superphosphate is seen in the profuse growth of clovers, which occurs in many of our wheat districts on fallowed and old cultivation land. Not only is this growth of value in providing valuable feed rich in protein, but it also encourages the formation of humus, an essential requirement for our wheat soils.

To obtain the best results from Subterranean clover, it is essential to top-dress the growth about July of each year with 1 cwt. of superphosphate per acre. Not only is a larger bulk of feed obtained by adopting this practice, but the plants form large quantities of seed, an essential factor with any annual plant if it is to be retained and encouraged to spread in a pasture.

The residual effect of the superphosphate is seen in the increased growth of the clover in the early part of the following year, the top-dressed sections providing early feed, whereas the unmanured portions carry little or no growth.

Converting old Cultivation Paddocks into Improved Pasture.—The use to which old wheat cultivation paddocks can be put is being demonstrated very effectively in many parts of the State by progressive farmers and graziers.

Mr. G. F. Hutchings, Yerong Creek, near Henty, has been planting Wimmera rye and lucerne for some years past, until now he has 300 acres of Wimmera rye, 200 acres of a mixture of Wimmera rye and lucerne, and a sprinkling of Wimmera rye over 500 acres.

The practice adopted is to sow the rye grass and lucerne with the last crop of wheat to be grown; the land is then turned over to grazing for five or six years. The mixture generally used is 2 lb. Wimmera rye and 2 lb. of lucerne. In this district it is estimated that this class of pasture will carry two sheep per acre, whereas the carrying capacity of unimproved pasture is slightly less than one sheep per acre.

The country is sweetened up by cultivation, and the better class grasses, such as Wallaby or White Top, reappear in the pasture.

The policy of planting Wimmera rye and lucerne is more effective than allowing the old cultivation simply to revert to barley grass, herbage, and weeds, which do not provide the quantity or quality of feed obtained from planting a few pounds of seeds of the plants which will supply good grazing practically all the year round.

Improved Pastures Increase the Value of a Property.—In the Riverina, Wimmera rye grass is proving of great value as a grazing proposition on old wheat lands, as well as on ordinary grazing country. An interesting remark was contained in a letter which I recently received from a grazier in that part of the State, who had over 400 acres of Wimmera rye grass on his property when he disposed of the holding in November, 1925. The letter said, "The buyer subsequently sold the property, over 3,000 acres, about six months later at an increased price of 22s. 6d. per acre, and the Wimmera rye appears to have played a part in the extra price received."

Fat Sheep and Fat Lambs.—If the ewes are in good condition and on good pastures at lambing time, the lambs are strong, and do not suffer any check in growth. Good succulent feed will ensure a bigger percentage of lambs than is the case where pasturage is dry and scanty.

In marketing fat sheep of any kind, and especially lambs for the export trade, it is essential that the flesh be free of grass seeds. In Spear grass country, if good, clean pastures are available, such as those obtained in Riverina and parts of the Western Slopes by the use of Wimmera rye, lucerne, Subterranean clover, &c., fat stock can be marketed free of this deleterious "seedy" material.

Better Pastures produce Better Products.—The most critical period in a sheep's life is during the first twelve months of its existence, for it is then that the animal largely builds up its framework, on which is dependent its wool and mutton producing powers. A strong, virile constitution, together with good pastures, enables the animal to withstand disease and produce a good class of wool, free from "break" and other detrimental features. Improved pastures, therefore, are valuable in that they provide more and better class wool and meat, and lessen the danger of disease occurring.

In all parts of the State prominent graziers, such as Messrs. C. E. Prell (Crookwell), S. M. Osborne (Adaminaby), H. F. White (Guyra), A. Bolger (Wallendbeen), S. Wilson & Co. (Gundagai and Wyalong), H. K. Nock (Parkes), J. Jardine (Nimmitabel), G. F. Hutchings (Yerong Creek), and many others, strongly advocate the establishment of better pastures, being quite convinced that the stock raised on good pastures are of better quality.

Mr. H. F. White, who is the largest grower of *Phalaris bulbosa* in Australia, having 800 acres under this grass, considers that two of the main advantages derived from improved pastures in cold localities, are that (1) the animals put on weight during winter months, whereas those feeding on native pastures lose condition; (2) that the quality of flesh, produced by grasses such as *Phalaris bulbosa,* is greatly superior to that made by animals feeding on native pasture.

In depasturing experiments conducted at Glen Innes Experiment Farm, we have demonstrated that not only do the sheep attain greater weight and fatten more rapidly on such grasses as *Phalaris bulbosa,* Cocksfoot, and Perennial rye, and White and Perennial red clovers, but in addition they return an average increase of 1 lb. of wool per sheep, per annum, over those grazing on native pastures. The trial under review extended over a period of three years, the same lot of sheep being used throughout the experiment. It might also be pointed out that the sheep on native pasture had access to leguminous and other food crop residues, stubble, and self-sown oats at various periods of the trial.

A striking example of the value of pasture improvement is shown in the work done by Mr. C. E. Prell, of Gundowringa, Crookwell. There are 7,000 acres on this property, and during the past six years a progressive policy of converting the rough native pastures into areas of valuable, succulent grasses and clovers has been adopted, until now more than one-third of the area is growing succulent Subterranean clover, Perennial rye, Cocksfoot, Tall Oat, *Phalaris bulbosa,* Perennial red clover, and Sheep's Burnet. On this property can be seen areas of improved pasture which are carrying three sheep per acre all the year round, whereas adjoining paddocks of unimproved native pasture will only support one sheep per acre.

From Small Beginnings to Larger Areas.—The success achieved by many farmers and graziers by adopting our recommendations is indicated in the additional areas planted each year by progressive landholders.

Two typical examples are as follows:—Mr. B. M. Minter, Carinya, Nangus, near Gundagai, planted in 1925 seed of a number of grasses, clovers, and lucerne. From the results obtained from this trial he stated in June, 1926, that "I have nearly 200 acres of ordinary wheat land fallowed for sowing a mixture of Wimmera rye, *Phalaris bulbosa,* Tall Oat, Tall or Hooker's Fescue, and a little lucerne next autumn."

The manager, Munderoo West, Wolsley Park, near Tumberumba, reports:—"An approximate area of 300 acres of Perennial Rye, Tall Oat, *Phalaris bulbosa,* and 250 acres of Subterranean clover are now established on this property. The *Phalaris bulbosa* is looking well, and made good growth through the winter, which is very severe in this district. Subterranean clover shows every indication of being a success in this locality."

Ploughing up Poor Pasture and Planting Seed effects Improvement.—In many instances where originally the pasture was of very poor quality, and growing inferior herbage plants, very considerable improvement has been effected by turning it over with ploughs or disc cultivators, and sowing a mixture of grasses and clovers.

This work has been adopted with advantage on many areas of ploughable Spear grass country on the Slopes and Riverina, the country having been converted into valuable grazing paddocks, free of "seedy" grasses, through cultivation and planting of grasses and lucerne on the deeper classes of soil, and Wimmera rye grass and Subterranean clover on the shallower types of land.

Broadcasting Seed amongst Native Grasses.—In many districts considerable improvement is being effected by simply broadcasting seed of grasses and clovers amongst the native grasses.

Where top-dressing machines are used, the opportunity should be taken to distribute grass and clover seed by mixing it with the fertiliser. As most of the top-dressing work is carried out in the autumn, this time synchronises with the correct period to sow winter grasses and clovers.

Lucerne.—The areas being sown on average wheat country that is reasonably deep and has produced fair crops of wheat, are increasing every year, and within the next ten years we should find many thousands of acres of lucerne planted for grazing purposes in the drier parts of the State. In good seasons large quantities of lucerne hay could be harvested from the better areas in this type of country, and what better standby could one have for drought periods than this product? It stacks and keeps well, and there is no grain present to attract rats and mice, as is the case with most other types of hay.

A considerable increase in the acreage under lucerne for grazing purposes has been recorded in the colder parts of the State, such as the Northern, Central, and Southern Tableland districts. Some years ago the general idea existed that lucerne would only grow satisfactorily on deep, rich, alluvial flats, but to-day we consider it to be one of our best and hardiest pasture plants for cold, as well as dry, localities.

Herbage and Weeds as Silage.—In a good year considerable quantities of valuable silage could be made from the profuse growth of clover burr, crowfoot, barley grass, mallow, variegated thistle, and other plants which are available in quantities in many of our grazing districts.

There are thousands of acres of pasture land, which are very free of fallen timber, stones, &c., and on which mowing machines could be operated to cut this valuable feed. It can be stored in pits as a standby for dry times, instead of allowing it to dry off as in the majority of cases it does now, and simply provide fuel for bush fires. Some of our pastoralists are conserving this valuable green feed as silage, but the practice should become more general. Silage is an excellent feed for sheep during drought on account of its laxative properties.

Clover burr hay is a very nutritious fodder, on account of the fact that the material contains large quantities of seed. The value of harvesting and stacking this material as a standby for dry periods is now recognised by a few pastoralists.

In the West.—In the far west the grazier is dependent upon native grasses, herbage, saltbushes, fodder shrubs, and trees to provide sustenance for the animals.

Indiscriminate clearing and picking up of all small timber is a mistake, as the area soon becomes windswept and bare of cover in which seeds could be retained and germinate, and the resultant plants become established.

In this section of the State, droughts, overstocking, and the rabbit invasion have been mainly responsible for the decreased carrying capacity of the country. The growth of the better-class native grasses of the Star or Windmill, Panic, Wallaby, Blue, and Mitchell types should be encouraged, and they should be given an opportunity to seed.

The more nutritious and drought-resistant species of our native grasses and saltbushes have been isolated and grown in seed reserves at our western experiment farms and on graziers' holdings, in order to raise supplies of seed for distribution to persons desirous of replenishing their pastures with these valuable dry-country plants.

Ask the Department for Advice.

An interesting example of the assistance that can be rendered by the Department to farmers was related by Councillor Herbert, President of the Jemalong Shire at the opening of the Forbes Agricultural Bureau conference. In anticipation of a continuance of the drought, he had last year grown a quantity of maize; but the drought broke earlier than was anticipated, and having no immediate use for the grain and the market not being good enough to sell at a profit, he was in a quandary as to how to utilise the product to advantage. He turned to the Department for advice and the suggestion was made that he should store the grain in tanks against another drought, and treat it to prevent weevil infestation. This he did at a total estimated cost for storage of 9d. per bushel, and he now has a good reserve of excellent feed and a high opinion of the Department.

Lamb-raising Trials, 1927.

Cowra Experiment Farm.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

BECAUSE they would not mate during December, so that the lambs could be disposed of before the grass seeds became troublesome in the spring, Lincoln x Merino ewes have not proved satisfactory for lamb-raising at Wagga Experiment Farm, but as it was considered that, with the slightly milder conditions and the six weeks earlier mating season, ewes of this cross would give a satisfactory percentage of lambs at Cowra, a number of ewes from Wagga were included in the trials, together with Border Leicester x Merino ewes at Cowra Experiment Farm this season, being joined with Dorset Horn and Ryeland rams. The expectations were realised; unfortunately it was not possible to divide the ewes into four lots for the lambing, so individual percentages were not obtained, but it will be seen from the tables that 158 of the 200 ewes lambed during the first lambing; as a number had twins, over 80 per cent. of lambs must have been marked. As at Wagga during the previous season the percentage was well under 60, the results at Cowra must be considered satisfactory.

It will be noticed that only about half the lambs were marketed. The lamb market for any but the best quality lambs was not a good one last season, and as there was an abundance of feed during the late spring and summer it was decided that one draft only should be sold, and the remainder shorn and kept over until the autumn. The very dry conditions prevailing during the winter and early spring gave the lambs a very bad start, hence at weaning time only about half of them were in good market condition.

The mating was as follows :—

Period of Mating.	Breed of Ram.	No. Used.	Percentage	Breed of Ewe.	No.	Total.
4th January to 1st March	Dorset Horn	6	2½	Lincoln x Merino	100	252
				Border Leicester x Merino	152	
	Ryeland ...	5*	2½	Lincoln x Merino	100	202
				Border Leicester x Merino ...	102	

*Shortly after the commencement of mating one of the Ryland rams died, leaving only four for service.

On 19th March all the rams were allowed in with the ewes in order that any ewes that missed service earlier would have an opportunity of getting into lamb. The rams were removed finally at the end of May.

The following table gives particulars of the first lambing :—

Breed of Ram	Ewe.	No. Mated.	Ewes Died prior to Lambing.	Ewes Died during Lambing.	Ewes Missed.	Percentage Missed.	Lambs Born.	Lambs Marked.	Lambs Died after Marking.	Percentage Born.	Percentage Marked.
Dorset Horn	Lincoln x Merino ...	100	2	2	19	19	268	248	8	106·3	98·4
	Border Leicester x Merino.	152	2	3	15	10					
Ryeland	Lincoln x Merino ...	100	...	4	23	23	214	191	6	107·9	94·5
	Border Leicester x Merino.	102	2	5	11	11					

Of the forty-two Lincoln cross ewes that did not lamb, quite a number lambed as the result of the second mating.

The following table shows the weights of the lambs at approximately two, three and four months old, and also the average increases in weight over a period of two months :—

Breed.		First Weighing (31st Aug.).	Second Weighing (4th Oct.)	Third Weighing (1st Nov.).	Average Increase over Sixty-one Days.
Ram.	Ewe.				
		lb.	lb.	lb.	lb.
Dorset Horn	Lincoln x Merino ...	45·4	55·41	71·17	25·77
	Border Leicester x Merino	50·75	60·66	74·45	24·
Ryeland ...	Lincoln x Merino ...	42·25	50·75	66·66	24·41
	Border Leicester x Merino	48·5	56·66	72·83	24·33

The following table shows the return per ewe mated, including the wool return :—

Breed of Lambs.	Ewes Mated.	Lambs Sold.	Average Price of Lambs.	Total Value of Lambs.	Value of Ewes Died during Lambing at £1 each.	Lambs not Sold.	Value of Lambs not Sold at 15s. each.	Total net value of Lambs.	Average Return from Lambs per Ewe Mated.	Average Wool Return per Ewe.	Average Return per Ewe Mated.
			s. d.	£ s. d.	£		£ s. d.	£ s. d.	s. d.	s. d.	s. d.
Dorset Horn Crosses.	252	123	22 6	138 2 9	9	117	87 15 0	214 17 9	17 0$\frac{1}{2}$	11 4	28 4$\frac{1}{2}$
Ryeland Crosses.	202	77	21 3	81 15 5	11	108	81 0 0	151 15 5	15 0$\frac{1}{2}$	11 4	26 4$\frac{1}{2}$

Orchard Heating and Smudge Firing.

H. BROADFOOT, Senior Fruit Instructor.

IN dealing with the phenomenon of frost, its causes, effects, and prevention, or at least the mitigation of its effects upon crops, we have the advantage of certain well established facts, and a store of empirical knowledge shared by all observant and thoughtful persons.

The Phenomenon of Frost.

Nearly everybody knows that temperature falls normally with ascent into the air, the rate being about 1 deg. Fahr., for every 350 feet of ascent, so that at a height of 6 miles atmospheric temperature is about 50 deg. Fahr. below zero. The air and the ground begin to cool after sunset, but the latter cools more rapidly than the former, so that by early morning the temperature of the ground is lower than the temperature of the superincumbent air. In the morning air temperature increases as the distance from the ground increases, the maximum air temperature being reached at a height of about 300 feet, though this may be modified by the nature of the atmospherical phenomena that have ruled during the night. As one rises to a height exceeding 300 feet the temperature falls, so that as one ascends before sunrise into the air one experiences an increasing temperature up to a height of about 300 feet, depending on the night, after which as one goes still higher it begins to get colder. It is well known that loss of heat occurs through radiation, and that heat distribution occurs as a result of (*a*) conduction and (*b*) convection.

Protection against the loss of heat can be obtained only by the addition of heat to such a point as to make up for heat losses which would otherwise bring the temperature below freezing point. If the temperature falls to 32 deg. Fahr. or below, frost is experienced. Frost may be either black or white. A white frost is characterised by the deposition of minute white crystals of ice upon exposed surfaces. A black frost is a temperature of 32 deg. Fahr. or less, without the foregoing phenomenon. A frost, too, may be local or general. The latter depends upon various atmospheric conditions, amongst which the following are the chief :—

(*a*) An influx of cold air from regions of lower temperature.
(*b*) Strong winds following or accompanying widespread occurrence of temperatures at 32 deg. Fahr. or below; and
(*c*) A low degree of atmospheric humidity.

Frosts will, of course, necessarily be black if the air is very dry, and white if atmospheric humidity be high.

That frost and dew "fall" is a common error—an error often shared by those who should know better. It is quite common to hear the expression "the fall of the dew." As a matter of fact dew and frost do not fall; they are formed on exposed surfaces as the result of local cooling.

Why "Frost Prevention" is Possible.

Various suggestions have been made for frost prevention. The plans usually followed in Canada are either smudging (*i.e.*, the causation of dense volumes of smoke which overlie the areas to be protected against frost),

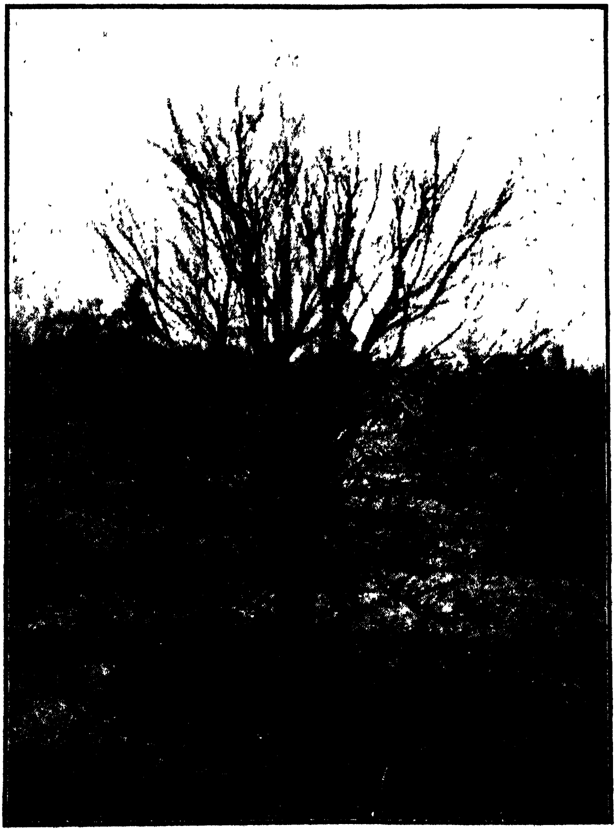


Fig. 1.—An Emperor Mandarin Tree with All its Branches killed by Frost. This tree was carrying a heavy crop of fruit.

or heating the overlying air stratum so that the temperature of that stratum does not fall to a point below 32 deg. Fahr., which would be likely to cause damage to crops.

Of the two methods mentioned, orchard heating is by far the most effective way of minimising or preventing losses by frost. It might be thought that so soon as the lower stratum of air was heated, it would rise and cold bodies

of air would replace the warm, but this is not so. A sort of atmospheric ceiling presents an obstacle to the ascension of air columns. This is easily understood. Suppose the air near the ground surface has a temperature of say 29 deg., and at a height of 300 feet it has a temperature of 38 deg. The former, warmed to the extent of 2 or 3 deg. will rise only until it reaches an air layer of equal temperature with itself So soon as it reaches such a layer ascension ceases. Thus it is apparent that there is no necessity to heat the whole volume of overlying air to a height of 300 feet, but only that part of the atmosphere which l es at a lower altitude than the "ceiling."

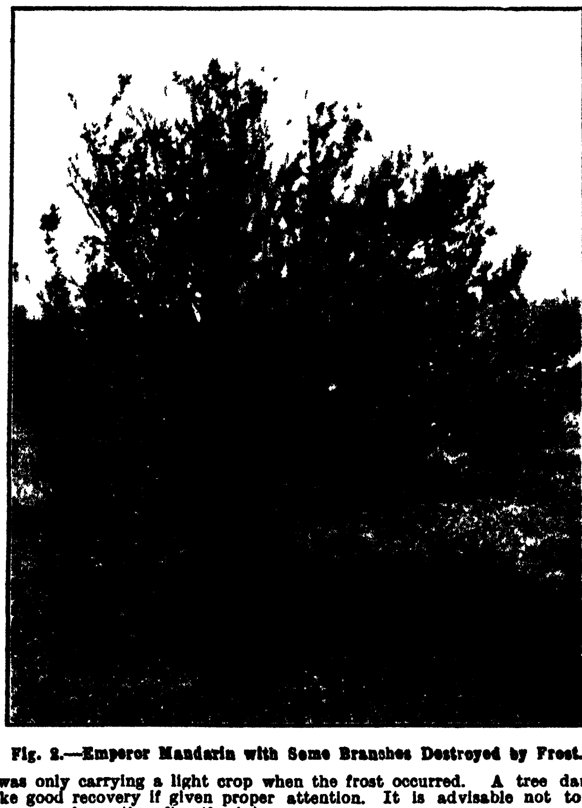


Fig. 2.—Emperor Mandarin with Some Branches Destroyed by Frost.

This tree was only carrying a light crop when the frost occurred. A tree damaged in this way will make good recovery if given proper attention. It is advisable not to remove any dead wood for several months after the injury.

It is clear from the foregoing that the possibility of orchard heating depends upon different air temperatures at different levels. If the air temperature were uniformly cold to considerable heights, heated air over the orchard would rise above the orchard to great heights, without in any appreciable degree raising the temperature of the lowest stratum of air—that is, of the air surrounding the trees. As gases heated by fires (it is found that many small fires heat the surrounding air much more rapidly and effectively than a few

large fires) mix with the surrounding colder air rapidly, the temperature of the whole is raised to only a very moderate degree, and the mixture of gases arising from the fires continues to rise only so long as the temperature of the mixture exceeds the temperature of the surrounding air. So soon as equality of temperature is reached elevation of the gases from the fire into the superincumbent air masses ceases.

To make the foregoing statement clear let us deal specifically with a suppositititious case—a case well within the bounds of possibility. Let it be supposed that the air above an orchard to a height of 6 feet has a temperature of 28 deg. Fahr., and that the air 40 feet above the orchard has a temperature

Fig. 3.—An Emperor Mandarin Tree with a few Extremities of Branches Injured by Frost.

This tree was carrying practically no fruit when the frost occurred.

of 34 deg. Fahr. When the heated gases given out by the fire mix with the surrounding air and raise its temperature from 28 deg. to 34 deg., the air so heated will have its specific gravity lowered, and it will rise, but the limit of its ascension will be the level of the air where the temperature is 34 deg. Its ascension will stop there because it has reached a level where the air has a temperature and specific gravity equal to its own. The process will continue until successive additions of heated gases have raised the temperature of the lowest stratum of air (that is, the air down to the ground) to 34 deg. The heat (whatever the means employed in its production) has

heated the whole body of air from the ground surface to a height of 40 feet to the extent of 6 deg. Fahr., or, in other words, has raised the temperature of the body of air to the height of 40 feet from 28 deg. to 34 deg.

Thus, instead of the heat produced by the orchard heaters having been uselessly expended in an attempt to raise the temperature of the whole of the overlying atmosphere it has been expended only in raising the temperature of that body of air which immediately, and to a more or less definite height, overlies the orchard. It has, in brief, raised the temperature of the layers of air into which the orchard trees or other vegetation project, and has raised it to a more or less definite height above the orchard.

The Means by which Heat may be Produced.

The object of orchard heating is to prevent such a lowering of temperature as will result in destructive frosts. It is not new, as it has been practised in California for some considerable time, and after much experimentation and

Fig. 4.—Two Late Valencia Trees Undamaged by Frost in the same row as Severely Damaged Emperor Mandarins.

It will be seen that one mandarin tree practically escaped injury; this tree was carrying practically no fruit at time of injury, while the damaged trees were carrying heavy crops, which, with the lack of soil moisture, adversely affected their vitality and rendered them more susceptible to frost damage.

years of practical experience with various fuels—wood, coal, coke, kerosene, crude oil, &c.—it was found that the last named, burned in heaters constructed for the purpose, was the most efficient. The low price of crude oil in California, as compared with the relatively high price in Australia, gives the Californian fruitgrower a great advantage over the Australian, but on the other hand frosts are much more frequent and severe in California than in Australia. As is usual, too, special circumstances created a special demand which was met by a special supply. American manufacturers by experimentation were able to place on the market a specially prepared crude oil, and specially manufactured heaters, prepared to meet the exigencies of the situation.

Are Australian Fruit Growers interested in Frost Prevention?

Here in Australia destructive frosts are so infrequent and the areas comparatively free from destructive frosts are so wide that what is a necessity in California is by no means a necessity in Australia. The occasional and limited losses incurred here take only a light toll of grower's resources, and usually amount to less over a reasonable term of years than the cost of frost preventing measures. In other words, the expense of such measures would be out of proportion to the gain. There are, however, localities where losses occur and where it is perhaps profitable to adopt protective methods. Doubtless, because of the labour and expenses involved, the prospective orchardist will usually avoid such localities in selecting a site, but the following suggestions on the subject are framed for the benefit of those who find themselves in the position of having to adopt them, or of suffering severe loss.

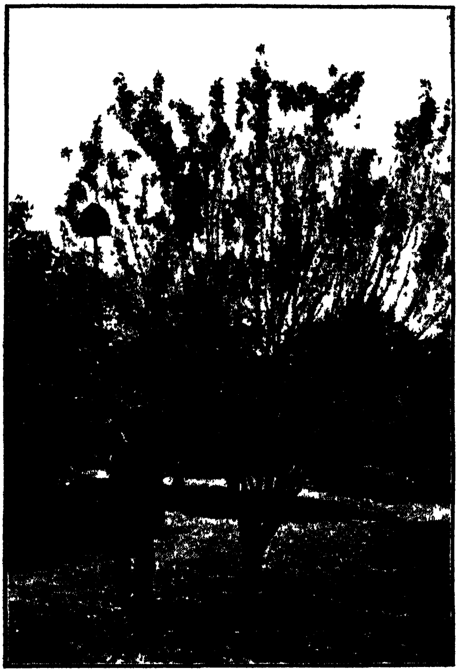


Fig. 5.—A Japanese Plum practically Defoliated by Frost.

Among the advantages of crude oil as a preventer of frost, not the least is that in suitable burners many fires can be set going in a short space of time. If the area is very liable to late frosts it may be necessary to light the heaters several nights within a short period of time. This, of course, adds greatly to the involved labour and expense. In localities where wood is plentiful, it is often used, and there is no doubt that wood fires have proved their efficacy. Labour, of course, is an important factor, for the number of fires required per acre of orchard would in the aggregate be considerable, and the labour of cutting and transporting the wood must be considered, while the time occupied in lighting the fires (the fuel perhaps being damp after rain) cannot be ignored. Large pieces of wood are preferable to small, but each fire would need some dry kindling wood placed in such a way as to expedite lighting. Some growers have used coal and coke in improvised burners, but there also kindling material is needed. Coal and carbon briquets have also been used.

Oil fuel has the great advantage over all other fuels. It is easy to light and easy to maintain at an even temperature, and the totality of the heating is easily regulated. If by reference to the thermometer it is found that the

temperature has been raised unnecessarily high, some of the burners can be readily extinguished, thus conserving fuel. Some saving of fuel can also be effected when heating is finished for the day by extinguishing the burners promptly. In the case of wood, in addition to the disadvantages already

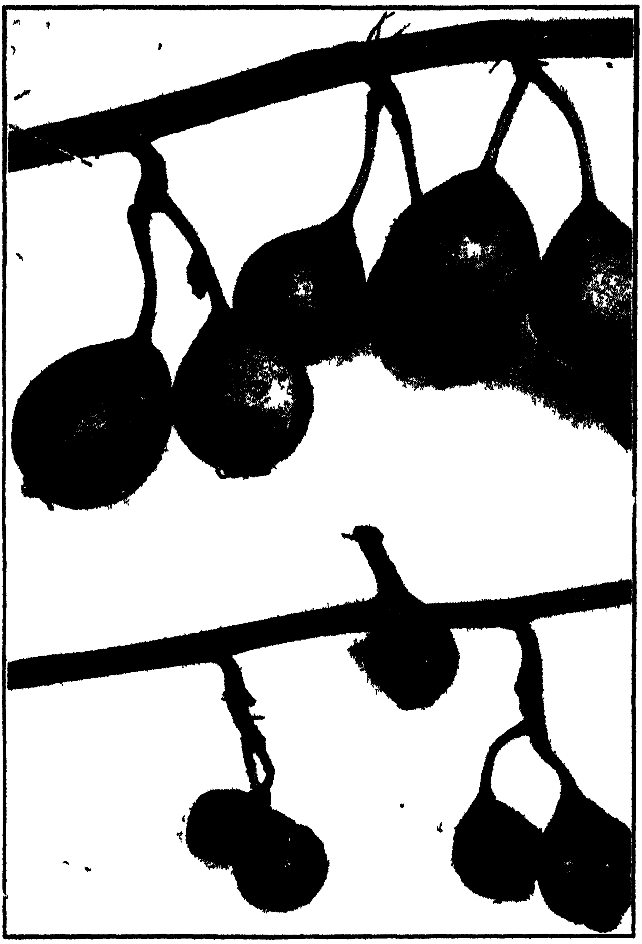


Fig. 6.—Winter Cole Pears.

Top Not damaged by frost

Bottom – Fruit grown in the same locality badly damaged by frost The injury occurred about calyx stage

noted, it is difficult to maintain an even temperature, and the fires cannot be extinguished so soon as they have served their purpose.

It is not possible to state definitely the number of fires required per acre on any given night, nor how long it would be necessary to maintain them,

but it would be advisable to have eighty or one hundred to the acre prepared. To light the whole of these on any given night might not be necessary, as this would depend upon certain conditions, not the least important of which would be the severity of the frost. The question of the temperature at which fires should be lighted is not so easily decided. It is, in fact, not possible to state the degree of frost which might cause damage to any given variety, at any given stage of development in any given locality, or in any given condition of the orchard, but it is important to orchardists to bear in mind that it is easier to maintain a satisfactory temperature than to raise it after it has fallen. In the former case no damage ensues, but in the latter case the temperature may have fallen to the danger point, and may remain there so long, before it is raised, as to cause severe damage. It is advisable to keep a keen eye on the thermometer, and if the fall is rapid and has reached 32 deg. Fahr., to light the fires, but if the temperature falls slowly it may be allowed to drop to 30 deg. before the fires are lighted. The latter is the lowest temperature the thermometer should indicate before fires are lighted.

Fig. 7. - Clay Mounds for Generating Smoke to Prevent Frost Damage.
As used by Mr. Mays at Rydal.

The one great danger when the temperature is falling slowly is that the grower will delay lighting the fires in the hope that the temperature will begin to rise. It very often happens that the temperature will fall slowly and reach a danger point and remain at such a point long enough to do considerable damage to crops before it commences to rise. On the other hand, it may keep on falling slowly, and the fruit be exposed to a low temperature long enough to cause severe losses before sufficient heat has been generated to raise the temperature to a safe degree.

Other very important considerations are (*a*) the area to be heated, (*b*) the labour available, and (*c*) the kind and state of the fuel. If labour is scanty, the area large and the fuel difficult to light, and not generating much heat until after the lapse of some considerable time, lighting must be begun earlier than if labour is relatively abundant, the area small, the fuel easily lighted, and maximum heat quickly generated.

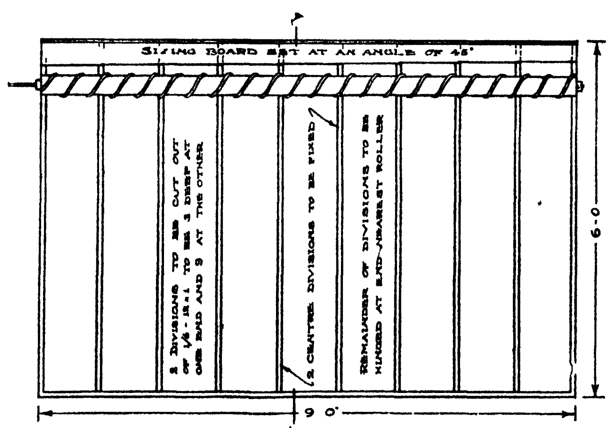
(*To be concluded.*)

A Home-made Fruit-sizing Machine.

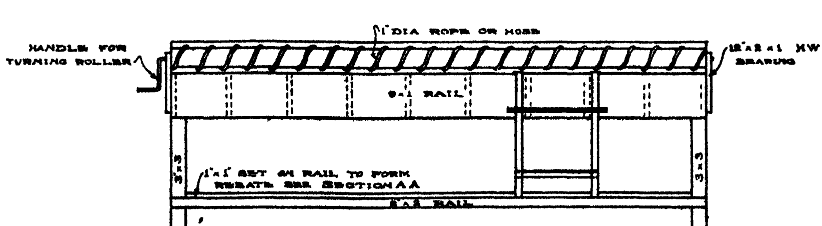
R. J. BENTON, Senior Fruit Instructor.

THE model of a home-made fruit-sizing machine carried on the Better Farming Train has created a number of inquiries as to the methods of construction, and the accompanying plans and details are intended to afford this information to orchardists.

A suitable machine may be constructed by any person at all handy with tools, and provided care is taken in making the actual sizing parts—the roller and the sizing board—it will be found of great assistance to more rapid and effective packing of most varieties of fruit. As the illustrations show, the sizing is done by feeding the fruit on to a recess between a roller, on which a rope is spirally wound, and a board, which is reduced one-eighth of an inch in width at each division or bin. The spirally wound rope acts as a conveyor of the fruit.



Plan of Fruit-sizing Machine.

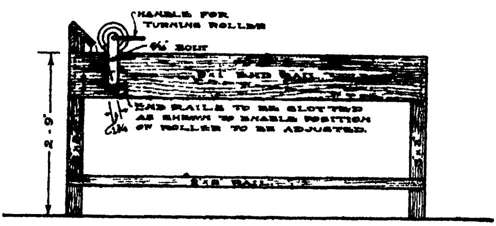


Side Elevation.

The following sizes of material are required to make a machine capable of sizing 100 bushels of fruit a day :—

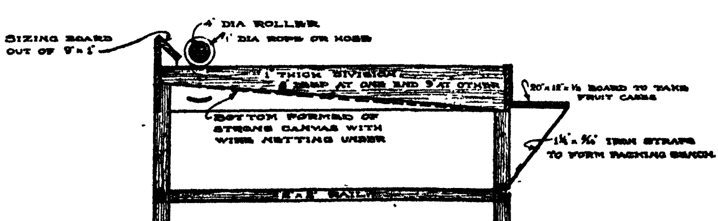
Four legs, 2 ft. 9 in., 3 x 3
Two sides, 9 feet, 9 x 1.
Two ends, 6 feet, 9 x 1.
Four boards, 6 feet, 12 x 1, cut to make division boards.
Two pieces, 9 feet, 2 x 2, bottom side rails.
Two pieces, 6 feet, 2 x 2, bottom end rails.
One piece, 9 feet, 1 x 1, nailed on to bottom rail as shown.
Two pieces, 12 inches, 2 x 1 (hardwood bearings for roller).
Timber also required to make a feed bin of sufficient size.
Four pieces of redwood quadrant, 9 feet long, not less than 2 inches (roller).
One piece, 9 feet, 6 x 1, for sizing board.
About 9 yards of 1 inch diameter rope.
Three yards strong canvas, 72 inches wide.
Three yards small mesh wire netting (to support canvas).
Four bolts, $2\frac{1}{4}$ x $\frac{3}{8}$ (to fix wooden bearings).
Material to make a packing stand, as illustrated.

It is recommended that, with the exceptions stated, dressed oregon be used throughout the construction, as it is light and strong.



End Elevation.

The roller should be made of four pieces of quadrant, to prevent dropping or warping. These are nailed together after fixing the axles securely. Fix it in position, and true up with a chisel and plane off as the chisel cuts indicate until the roller is quite round. The larger the roller the better; the greater the moving surface, the more turning the fruit receives. The rope should be nailed on to the roller.



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Should any jambing of fruit occur when the roller is turned outward from the sizing board, the reason is because the rope has been wound too far apart on the roller. It should be fixed a little closer—that is, at less pitch.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of the Poultry Expert.)

Twenty-sixth Year's Results, 1927–28.

F. H. HARVEY, Acting Organising Secretary.

THE Twenty-sixth Egg-laying Competition at Hawkesbury Agricultural College commenced on 10th April, 1927, and terminated on 31st March, 1928, a period of 357 days. The reason for opening the competition on 10th April is that the interval between the 1st and the 10th makes it possible to remove from the pens the birds in the last competition and to place the new entrants in their pens without an intermediate change.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. *James Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, W. M. Mulliner, and L. A Ellis (competitors' representatives), and C. E. Houghton (Department of Agriculture), Organising Secretary.

Scope of the Competition.

The competition embraced the usual four sections, was limited to pullets between seven and twelve months old on 9th April, 1927, and pens were allotted as follows :—

	Groups.	Birds.		Groups.	Birds.
Section A.			*Section C1.*		
Open Light Breeds :—			Standard Light Breeds :—		
White Leghorns ...	50	300	White Leghorns ...	4	24
			Minorcas	1	6
Section B.			*Section C2*		
Open Heavy Breeds :—			Standard Heavy Breeds :—		
Black Orpingtons .	22	132	Black Orpingtons ...	2	12
Langshans	7	42	Langshans	1	6
Plymouth Rocks ...	1	6	Columbian Wyandottes	1	6
			Light Sussex	1	6
			Totals	90	540

Weight of Eggs.

The regulation that individual hens must lay eggs of at least 2 oz. weight each, and that eggs from groups must average at least 24 oz. per dozen within four months of the commencement of the competition in order to be eligible

* During the period of the competition Mr. J. Hadlington retired from the Department and was succeeded by Mr. E. Hadlington.

for prizes, resulted in the disqualification of twenty-five individual hens and five groups, as follows :—

Disqualified from Individual Prizes.

Light Breeds.—A. Campbell (No. 237), S. F. Cooling (No. 275), D. R. Dove (No. 285), H. W. T Hambly (No. 324), J. H. Hayes (No. 21), H. W. Jones (No. 357), L H. Rannard (No. 423).

Heavy Breeds.—P. A. Barrett (No. 136), A. E. Brown (No. 139), Mrs. M. G. Cummings (No. 16), W. C. Hardy (No. 34), C. B. Knight, (No. 62), J. D Martin (No. 176), F. Moulang (No. 87), A. H. Moxey (Nos. 92 and 94), Woodlands Poultry Farm (Nos. 99 and 100), W. W. Tennent (No. 113), A. R. Wheatley (No. 125), J. D. Pennicuik (Nos. 529, 530, 531, 533 and 534).

Disqualified from Group Prizes.

Light Breeds H. W. T. Hambly.

Heavy Breeds.—P. A. Barrett, A. H. Moxey, Woodlands Poultry Farm, J. D. Pennicuik.

The Financial Aspect.

The quantities of feed consumed by the 540 birds were as follows :—

Wheat	328 bushels 50 lb.	Salt	265 lb.
Maize	176 ,, 9 ,,	Shell grit	1 ton 4 cwt.
Pollard	766 ,, 2 ,,	Green feed	81 cwt. 104 lb.
Bran	383 ,, 1 ,,	Epsom salts... ...	51 lb.
Meat meal... ...	13 cwt. 72 ,,		

The total cost of the foodstuffs as purchased by the College was £257 16s 5d., equal to 9s. 6d. per head. As the conditions under which the College obtains its supplies are somewhat different from those affecting the average commercial poultry farmer, the cost of food was worked out also on the basis of purchasing on the Sydney market, when it was found to be £258 15s. 4d., equal to 9s. 7d. per head, or practically identical with the actual College purchasing price.

Calculated at Sydney ruling market prices for new laid eggs, the value of the eggs laid in the competition was £830 4s. 10d., equal to a net price of 1s. 10d. per dozen.

The Monthly Laying.

Month		Section A. Open Light Breeds.		Section B. Open Heavy Breeds.		Section C1. Standard Light Breeds		Section C2. Standard Heavy Breeds		Total.
		Total for 300 hens.	Average per hen	Total for 180 hens.	Average per hen	Total for 30 hens	Average per hen	Total for 80 hens	Average per hen	
April,	1927	1,963	6 5	1,683	9 4	103	3 4	161	5 4	3,910
May,	,,	3 845	12·8	2,934	16·3	297	9·9	510	17·0	7,586
June,	,,	4,671	15·6	3,435	19·1	390	13 0	430	14·3	8,926
July,	,,	5,829	19·4	3,987	22 2	417	13 9	590	19·7	10,823
August,	,,	6,490	21·6	4,169	23·2	570	19 0	654	21 8	11,883
September,	,,	6,740	22 5	4,089	22·7	628	20 9	631	21 3	12,088
October,	,,	6,811	22·7	3,841	21·3	623	20 8	617	20 6	11,892
November,	,,	6,060	20·2	3,036	16 9	581	19·4	485	16·[illegible]	10,162
December,	,,	5,654	18·8	2,675	14·8	483	16·1	415	13 8	9,227
January,	1928	5,692	19·0	2,742	15 2	424	14·1	452	15·1	9,310
February,	,,	4,381	14·6	2,408	13·4	288	9·6	382	12 7	7,459
March,	,,	3,317	11·1	2,307	12·8	229	7·6	419	14·0	6 272
Total	...	61,4[illegible]3	204·8	37,306	207·2	5,033	167·[illegible]	5,746	191·5	109 538

Averages of Breeds.

No. of Birds	Breed.	Eggs per Hen.	Weight of eggs per dozen.	Value per Hen.
	Open Light Breeds.		oz.	£ s. d.
300	White Leghorn	203·9	25¼	1 10 9
	Open Heavy Breeds.			
132	Black Orpington	211·6	25	1 12 8
42	Langshan	198·3	25¼	1 10 6
6	Plymouth Rock	167·5	24¾	1 5 9
	Standard Light Breeds.			
24	White Leghorn	162·3	25¼	1 4 8
6	Minorca	153·2	27¾	1 1 8
	Standard Heavy Breeds.			
12	Black Orpington	195·7	25	1 10 7
6	Langshan	223·2	26	1 15 0
6	Columbian Wyandotte ...	184·0	21¾	1 7 8
6	Light Sussex	171·5	25¾	1 6 1

Mortality and Disease.

As compared with previous years, the position as regards mortality and disease was favourable, the casualties being thirty-two, as against thirty-seven in 1926–27, and forty-two in the year 1925–26, particulars being as follow:—

	1926-27.		1927-28	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds.
Birds replaced	7	3	6	3
Birds not replaced	13	14	11	12

Weights of Winning Birds.

The following are the weights at the beginning and end of the competition of the birds laying the greatest number of eggs:—

		Weight at April, 1927.		Weight at March, 1928.	
Groups.		lb.	oz.	lb	oz.
Light Breeds—					
F. T. Turner's White Leghorns, Nos....	451	3	8	3	8
	452	3	8	3	12
	453	3	8	3	10
	454	3	8	3	8
	455	3	8	3	8
	456	3	8	3	10
Heavy Breeds—					
C. Judson and Son's Black Orpingtons, Nos.	55	5	4	6	4
	56	5	4	6	12
	57	5	0	5	12
	58	5	4	4	12
	59	5	0	6	0
	60	6	4	7	12
Individual Hens.					
Light Breeds—					
B. Clarke's White Leghorn, No. 254		4	2	4	0
Heavy Breeds—					
W. W. Tennent's Black Orpington, No. 110 ...		5	2	6	4

Three of Messrs. C. Judson & Son's Black Orpingtons.

Winners of the Golden Egg of 1928, awarded by Metropolitan Meat Industry Board.
Score, 77½ points.

Three of Mr. F. T. Turner's White Leghorns.

Grand Champion Prize for laying eggs of greatest market value (£11 11s. 6d.)

Annual Competition.

Full details of the financial and other results since the inception of the competition are given in the following comparative table:—

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...		38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd ...		70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd ..		100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th ...		100	1,411	635	168	166	-/11¼	13/3	5/3½	8/-
5th ...		100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th ...		60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th ...		50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th ...		60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th ...		40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th ...		50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th ...		50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th ...		50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th ...		63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th ..		70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
	B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
16th	A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
17th	A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
18th	A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
	B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
	C1	3	1,304	977	138	195	1/10	27/8	9/3	18/5
	C2	7	1,336	955	150	191	1/10	28/5	9/3	19/2
19th	A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
	B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
	C1	5	1,425	944	148	195	2/2	36/-	12/8	23/4
	C2	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
20th	A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
	B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
	C1	5	1,092	885	144	168	1/11	24/7	11/9	12/10
	C2	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
21st	A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
	B	30	1,417	790	164	188	1/9	27/5	10/10	16/7
	C1	5	1,220	864	149	176	1/9	25/8	10/10	14/10
	C2	5	1,212	931	144	187	1/9	27/3	10/10	16/5
22nd	A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
	B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
	C1	5	1,307	692	142	170	1/6	21/1	9/9	11/4
	C2	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
23rd	A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
	B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
	C1	5	1,291	950	146	180	1/8	23/5	9/11	13/6
	C2	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6
24th	A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
	B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
	C1	5	1,248	881	136	187	1/6	25/-	10/-	15/-
	C2	5	1,331	777	151	186	1/6	24/7	10/-	14/7
25th	A	51	1,531	797	162	209	1/8½	29/4	11/-	18/4
	B	29	1,519	753	161	204	1/8½	29/2	11/-	18/2
	C1	5	1,319	1,092	147	173	1/8½	23/8	11/-	12/8
	C2	5	1,326	842	155	203	1/8½	28/9	11/-	17/9
26th	A	50	1,505	885	162	205	1/10	30/9	9/7	21/2
	B	30	1,487	1,005	165	207	1/10	31/11	9/7	22/4
	C1	5	1,234	[illegible]90	138	168	1/10	24/1	9/7	14/6
	C2	5	1,3[illegible]9	1,029	149	192	1/10	30/-	9/7	20/5

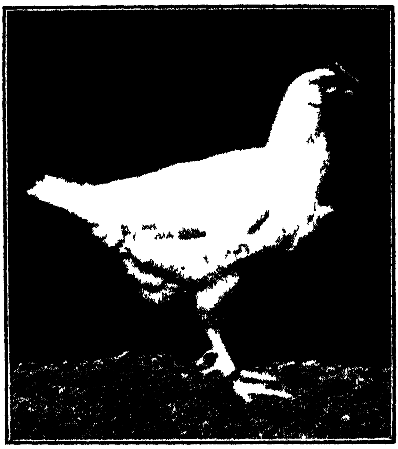
PRIZE LIST.

GRAND CHAMPION PRIZE. (VALUE £5 5s.)

For group of six birds laying eggs of the greatest market value, without replacement of a bird ; each bird to lay eggs of prescribed standard of 24 oz. per dozen or over :—F. T. Turner's White Leghorns, market value £11 11s. 6d. (1,505 eggs).

GOLDEN EGG, 1928. (VALUE £25.)

Presented by the Metropolitan Meat Industry Board, for group of six birds, points to be awarded for number, quality and market value of eggs, also standard quality of the birds : -C. Judson and Son's, Black Orpingtons, 77½ points.



Three of Mr. F. T. Wimble's White Leghorns.

Winners of the Special Prize donated by Mr W H Paine for group in opposite section to the winners of the golden egg, scoring highest points under the same conditions The group scored 73 points

SPECIAL PRIZES.

The W. H. PAINE CONSOLATION PRIZE, value £10 10s. (donated by Mr. W. H. Paine, Manager, Animal Foods Department, Metropolitan Meat Industry Board), for the leading group, judged on the same scale of points, in the division opposite to the winner of the Golden Egg, 1928 :—F. T. Wimble's, White Leghorns, 73 points.

The C. JUDSON AND SON'S 200-EGG PRIZE, value £2 2s., (donated by Messrs. C. Judson and Son) for the first hen to secure a score of 200 eggs of prescribed weight (their own birds being ineligible) :—A. R. Wheatley's Black Orpington. This bird laid its 200th egg on the 218th day of the competition.

The W. M. MULLINER EGG WEIGHT PRIZE, value £2 2s. (donated by Mr. W. M. Mulliner) for the group laying the greatest number of eggs, with a minimum of 26 oz. and maximum of 28 oz. per doz. for each hen, eggs to be normal in shell, texture and shape :—E. F. Goldsmith's White Leghorns. Each bird laid eggs of 28 oz per dozen, total score, 1,148 eggs.

The WIMBLEFORD MINIMUM SCORE PRIZE, value £3 3s. (donated by Mr. F. T. Wimble) for groups scoring 1,350 eggs or more, light breeds sections, points to be awarded according to individual laying from 225 eggs, all eggs to be of standard weight and no entry from the donor to compete :—Mr. F. T. Turner's White Leghorns, 13 points.

QUALITY PRIZES (OPEN SECTIONS).

For highest score from groups selected for standard points and laying 1.200 eggs or over.

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 1,487 eggs, £5 ; A. Thompson (Black Orpingtons), 1,399 eggs, £2 10s.

Light Breeds.—F. T. Wimble (White Leghorns), 1,459 eggs, £5 ; I. Lowery (White Leghorns), 1,455 eggs, £2 10s.

QUALITY PRIZES (STANDARD SECTIONS).

For highest scores from groups in the standard sections, with a minimum of 1,100 eggs.

Heavy Breeds.—R. Thompson (Langshans), 1,339 eggs, £2 ; W. M. Mulliner (Black Orpingtons), 1,284 eggs, £1.

Light Breeds.—J. Cornwell (White Leghorns), 1,234 eggs, £2 ; J. H. Hayes (White Leghorns), 1,203 eggs, £1.

HIGHEST AVERAGE PRIZES (GROUPS OF FIVE OR SIX BIRDS).

Heavy Breeds.—Mrs. J. H. Madrers (Black Orpingtons), average 251 eggs, £3 ; C. Judson and Son (Black Orpingtons), average 247·8 eggs, £2 10s.; W. W. Tennent (Black Orpingtons) average 247 eggs, £2 ; W. C. Hardy (Black Orpingtons), average 243·5 eggs, £1 10s.

Light Breeds.—F. T. Turner (White Leghorns), average 250·8 eggs, £3 ; F. T. Wimble (White Leghorns), average 243·2 eggs, £2 10s.; I. Lowery (White Leghorns), average 242·5 eggs, £2 ; W. J. Williams (White Leghorns), average 239·5 eggs, £1 10s.

GREATEST NUMBER OF EGGS (GROUPS OF SIX BIRDS).

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 1,487 eggs, £3 ; W. W. Tennent (Black Orpingtons), 1,482 eggs, £2 10s.; W. C. Hardy (Black Orpingtons), 1,461 eggs, £2; A. Thompson (Black Orpingtons), 1,399 eggs, £1 10s.; Mrs. M. G. Cummings (Black Orpingtons), 1,394 eggs, £1.

Light Breeds.—F. T. Turner (White Leghorns), 1,505 eggs, £3 ; F. T. Wimble (White Leghorns), 1.459 eggs, £2 10s.; I. Lowery (White Leghorns), 1,455 eggs, £2 ; W. J. Williams (White Leghorns), 1,437 eggs, £1 10s.; Watson and Stepney (White Leghorns), 1,433 eggs, £1.

HIGHEST INDIVIDUAL SCORES.

Heavy Breeds.—W. W. Tennent (Black Orpington), 310 eggs, £2 10s.; C. Judson and Son (Black Orpington), 301 eggs, £2 ; J. W. Smiles (Black Orpington), 300 eggs, £1 10s.; A. Thompson (Black Orpington), 298 eggs, £1.

Light Breeds.—B. Clarke (White Leghorn), 294 eggs, £2 10s.; I. Lowery (White Leghorn), 293 eggs, £2 ; C. Leach (White Leghorn), 283 eggs, £1 10s.; A. Hughes (White Leghorn), 276 eggs, and F. T. Turner (White Leghorn), 276 eggs, divide £1.

QUARTERLY PRIZES (GROUPS OF SIX BIRDS).

Winter test (10th April, 1927 to 30th June, 1927) :—

Heavy Breeds.—A. R. Wheatley (Black Orpingtons), 360 eggs, £2 ; J. Bickle (Black Orpingtons), 350 eggs, £1 10s.

Light Breeds.—S. E. Daley (White Leghorns), 294 eggs, £2 ; S. F. Cooling (White Leghorns) 290 eggs, £1 10s.

Spring test (1st July to 30th September, 1927) :—

Heavy Breeds.—Woodlands Poultry Farm (Black Orpingtons), 488 eggs*; A. E. Ross (Langshans), 454 eggs, £1 10s. ; A. R. Wheatley, (Black Orpingtons), 447 eggs, £1.

Light Breeds.—W. J. Williams (White Leghorns), 441 eggs, £1 10s. ; I. Lowery (White Leghorns), 439 eggs, £1.

Summer test (1st October to 31st December, 1927) :—

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 429 eggs, £1 10s.; W. W. Tennent (Black Orpingtons), 386 eggs, £1.

Light Breeds.—I. Lowery (White Leghorns), 454 eggs, £1 10s.; K. G. Cobcroft (White Leghorns), 434 eggs, £1.

Autumn test (1st January to 31st March, 1928) :—

Heavy Breeds.—W. C. Hardy (Black Orpingtons), 360 eggs, £2 ; W. W. Tennent (Black Orpingtons), 354 eggs, £1 10s.

Light Breeds.—F. T. Turner (White Leghorns), 411 eggs, £2 ; H. W. Jones (White Leghorns), 355 eggs, £1 10s.

* Ineligible for prize, as eggs were under prescribed weight.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-SIXTH ANNUAL COMPETITION.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
	Open Section : Heavy Breeds.							oz.	£	s.	d.
C. Judson & Son : Black Orpingtons	210	*224	301	260	250	242	1,487	26	11	5	9
W. W. Tennent : Black Orpingtons	224	310	266	241	‡230	211	1,482	24½	11	7	4
W. C. Hardy : Black Orpingtons	219	188	264	‡274	245	271	1,461	24½	11	17	0
A. Thompson : Black Orpingtons	212	223	224	232	210	298	1,399	24½	10	19	6
Mrs. M. G. Cummings : Black Orpingtons.	232	255	235	‡223	229	220	1,394	25	10	17	5
A. R Wheatley : Black Orpingtons	249	†189	280	214	‡228	233	1,393	24¾	10	18	3
Woodlands Poultry Farm : Black Orpingtons.	289	207	‡251	‡187	220	232	1,386	‡23½	10	8	1
F. C. Nicholls : Langshans... ..	227	225	239	238	229	209	1,367	26½	10	14	9
Mrs. J. H. Madrers : Black Orpingtons.	230	211	276	266	†110	272	1,365	24	10	15	6
A. H. Moxey : Black Orpingtons ..	194	‡201	226	‡258	†204	231	1,314	‡23¼	9	19	3
J. W. Smiles : Black Orpingtons ...	227	131	264	170	300	215	1,307	25	10	0	9
Mrs. V. Cox : Black Orpingtons ...	249	154	172	216	230	272	1,293	25½	9	14	8
F. Moulang : Black Orpingtons ...	263	191	‡254	193	229	†138	1,268	24	9	17	8
A. E. Ross : Langshans	222	219	173	179	207	233	1,233	25¾	9	5	11
W. Griffin : Langshans	189	188	185	191	248	225	1,226	25½	9	10	5
Mrs. C. B. Ferguson : Black Orpingtons.	240	178	242	202	194	168	1,224	26	8	19	8
R. G. & E. Whalan : Langshans...	227	†128	198	251	220	188	1,212	26	9	8	0
C. B. Knight : Black Orpingtons	239	‡128	262	144	173	258	1,204	24¼	9	9	4
S. C. Zealey : Black Orpingtons ...	240	208	†139	188	244	185	1,204	26	9	7	10
A. W. Bower : Black Orpingtons...	234	197	130	259	146	232	1,198	26	9	6	9
P. A. Barrett : Langshans... ...	189	180	199	‡179	180	264	1,191	‡23¾	9	2	10
Grasemere Poultry Farm : Black Orpingtons.	165	173	194	200	†155	269	1,156	26½	8	19	3
J. Buckle : Black Orpingtons ...	†94	258	135	118	262	244	1,111	24½	8	17	10
T. McDonald : Black Orpingtons...	157	205	231	*225	*170	119	1,107	25¼	8	2	4
E. C. Lunn and Son : Black Orpingtons.	172	175	215	197	†114	203	1,076	24¼	8	5	10
J. G. Hartas : Black Orpingtons ...	177	214	230	139	162	153	1,075	26¼	8	6	6
J. Every : Langshans	168	128	150	196	170	259	1,071	25¼	8	3	8
A. E. Brown : Langshans	‡155	202	151	134	255	†133	1,030	24	7	16	0
P. J. Hooker : Black Orpingtons...	154	207	221	114	157	177	1,030	26	7	14	10
J. D Martin : Plymouth Rocks ...	†146	†‡69	208	231	181	170	1,005	24¾	7	14	6

* Signifies bird replaced and previous score struck out.
† Signifies bird dead and score retained.
‡ Signifies ineligible for prizes, as eggs were under the prescribed weight of 24 oz. per dozen.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-SIXTH ANNUAL COMPETITION—*continued.*

Owner and Breed.	Totals of Individual Hens.						Totals of Groups	Weight of Eggs per dozen.	Market Value of Eggs.		
Open Section : Light Breeds.								oz.	£	s.	d.
F. T. Turner : White Leghorns ...	229	264	245	276	239	252	1,505	25¼	11	11	6
F. T. Wimble : White Leghorns ..	273	231	265	219	201	270	1,459	25¾	11	2	2
I. Lowery : White Leghorns ...	293	266	217	220	218	246	1,455	24⅛	10	17	8
W. J. Williams : White Leghorns..	271	272	207	228	213	246	1,437	26	10	14	6
Watson & Stepney : White Leghorns	241	224	250	245	262	211	1,433	24	10	16	2
K. G. Cobcroft : White Leghorns ..	244	220	273	198	216	261	1,412	24¾	10	12	5
L. A. Ellis : White Leghorns ...	207	227	224	245	250	252	1,405	26¼	10	17	2
A. Hughes : White Leghorns ...	217	199	198	233	276	266	1,389	25⅛	10	13	0
S. F. Cooling : White Leghorns ...	227	195	244	251	‡276	186	1,379	24⅛	10	19	8
Bide-a-Wee Poultry Farm : White Leghorns.	257	265	196	262	196	*193	1,369	24¾	10	8	11
H. W. Jones : White Leghorns ..	219	232	‡229	234	247	183	1,344	25	10	5	3
C. Leach : White Leghorns ..	191	182	220	215	283	253	1,344	26¼	10	4	1
B. L. Blake : White Leghorns ..	265	249	†131	230	240	†227	1,342	25¼	10	4	1
Southern Cross Poultry Farm. White Leghorns.	220	226	212	233	192	242	1,325	24	10	4	6
D. R. Dove : White Leghorns ..	189	196	‡250	207	246	232	1,320	24¼	10	0	7
W. Glynn : White Leghorns ..	184	204	234	201	249	237	1,309	25¾	9	16	8
H. L. Abrook : White Leghorns	225	205	241	185	215	*229	1,300	26½	9	14	2
B. Clarke : White Leghorns ..	242	294	250	251	259	0	1,296	24¼	10	0	10
Hilder Bros. : White Leghorns ...	187	251	196	215	203	237	1,289	26	10	4	8
H. W. T. Hambly : White Leghorns	231	275	166	177	178	‡257	1,284	‡23¾	9	18	10
W. G. Hosking : White Leghorns...	168	249	218	167	231	227	1,260	25	9	10	0
L. Piper. White Leghorns... ...	229	230	181	204	173	229	1,246	24⅛	9	3	9
H. Cole : White Leghorns	183	216	211	179	245	206	1,240	25	9	5	0
G. N. Mann : White Leghorns ..	204	216	89	224	259	244	1,236	24¾	9	3	6
G. T. Stirton : White Leghorns ..	196	†124	225	226	225	239	1,235	25¼	9	6	7
A. Campbell : White Leghorns ..	191	222	‡254	161	199	198	1,225	26¼	9	6	2
F. A. Bailey : White Leghorns ...	238	179	202	101	245	253	1,218	24¼	9	2	4
G. H. Floyd : White Leghorns ...	236	221	181	221	179	175	1,213	25⅛	9	18	5
R. G. Christie & Son : White Leghorns.	†148	148	173	241	266	230	1,206	24⅛	9	12	1
Parkhill Poultry Farm : White Leghorns.	231	203	178	186	185	193	1,176	26	8	8	5
T. Buckley : White Leghorns ..	160	210	156	202	192	239	1,159	26⅛	8	13	4
H. Holmes : White Leghorns ..	178	212	210	176	153	225	1,154	24¾	8	7	3
P. O. Ranch : White Leghorns ...	212	204	219	†78	212	224	1,149	25¼	8	7	0
E. F. Goldsmith : White Leghorns	76	211	216	205	195	245	1,148	28	8	19	9
S. E. Daley : White Leghorns ..	121	221	234	137	†172	257	1,142	26	8	14	10
H. C. Bailey : White Leghorns ..	200	*151	188	202	205	190	1,136	27	8	9	3
Mrs. L. J. Bowden : White Leghorns	205	191	163	222	198	155	1,134	25¼	8	3	8
W. Hathway : White Leghorns ..	262	221	187	232	132	96	1,130	26	8	13	2
A. W. Lewis : White Leghorns ..	221	194	200	129	217	161	1,122	26¾	8	7	2
W. E. Strickland : White Leghorns	244	246	231	†155	106	139	1,121	26	8	7	4
M. & A. McInnes : White Leghorns	177	165	188	157	181	221	1,089	25	8	0	8
Macksville Poultry Farm : White Leghorns.	183	188	186	140	168	205	1,076	26	7	15	4
J. L. Rayner : White Leghorns ...	141	239	191	202	*139	146	1,058	26	8	3	0
L. H. Rannard : White Leghorns...	148	198	‡152	188	184	†169	1,039	24¾	7	13	9
D. Asher : White Leghorns ..	190	189	†113	224	198	120	1,034	25¼	8	4	0
F. G. Lombe : White Leghorns ..	177	167	177	148	166	189	1,024	25⅛	7	10	10
A. Greentree : White Leghorns ..	188	170	181	182	101	196	1,018	25¼	7	5	11
J. Westmacott : White Leghorns..	204	169	174	188	*79	161	975	25	7	0	5
H. P. Christie : White Leghorns ...	180	158	221	160	0	217	936	25¼	6	16	1
P. Smith and Son : White Leghorns	104	198	120	204	†53	206	885	25¼	6	6	4
Standard Section : Light Breeds.											
J. Cornwell : White Leghorns ..	233	202	196	189	207	207	1,234	26	9	8	2
J. H. Hayes : White Leghorns ..	232	259	61	191	238	‡222	1,203	24	8	3	2
C. A. Clarke : Minorca	134	148	147	163	124	203	919	27¾	6	10	7
F. C. Emery : White Leghorns ...	149	146	123	186	157	146	907	25	6	4	0
R. Newton : White Leghorns ...	225	181	136	52	109	†87	790	26⅛	5	15	8
Standard Section : Heavy Breeds.											
R. Thompson : Langshans... ..	173	240	220	205	261	240	1,339	26	10	9	9
W. M. Mulliner : Black Orpingtons	215	231	224	170	196	248	1,284	25¼	9	17	1
J. D. Pennicuik : Col. Wyandottes	‡222	‡215	‡155	149	‡180	‡183	1,104	‡21¾	8	6	0
J. L. Cole : Black Orpingtons ...	198	123	185	166	248	149	1,064	24¾	8	9	8
J. E. Gibson : Light Sussex ...	77	221	131	243	184	173	1,029	25¾	7	16	7

* Signifies bird replaced and previous score struck out.
† Signifies bird dead and score retained.
‡ Signifies ineligible for prizes, as eggs were under the prescribed weight of 24 oz. per dozen.

Monthly Laying of Individual Prize Winners.

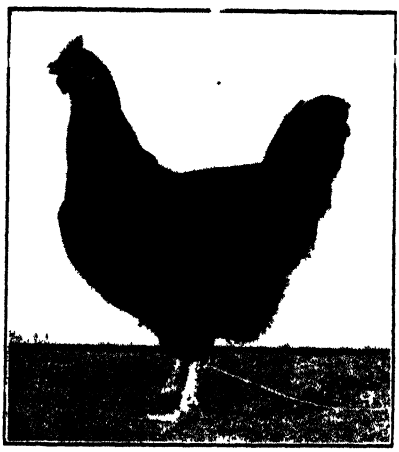
The following table shows the monthly laying of winners of the individual prizes for highest scores :—

Owner.	April.	May.	June.	July	August.	September	October.	November	December.	January.	February	March	Total.
					Light Breeds.								
B. Olarke	13	25	25	26	26	26	28	25	25	28	23	24	94
I. Lowery .	12	27	26	28	28	26	29	26	27	27	24	13	293
C Leach	14	22	23	23	23	26	26	26	24	26	24	26	283
S F Cooling	15	22	23	22	25	24	29	26	24	24	23	19	*276
A Hughes	16	23	22	23	23	24	27	24	23	23	24	24	276
F. T Turner	15	23	20	23	22	24	27	24	24	27	24	23	276
					Heavy Breeds.								
W W Tennent .	17	26	25	28	28	29	29	27	25	26	21	29	310
C Judson and Son	16	26	28	28	30	30	28	27	21	24	17	26	301
J W. Smiles	17	22	27	27	27	28	31	26	27	26	28	19	300
A Thompson	19	27	26	25	26	26	25	23	24	28	26	23	298

* Ineligible for prize, eggs being under the prescribed standard of 24 oz per dozen

THE POULTRY EXPERT'S COMMENTS.

A comparison with last year's figures shows a somewhat lower general average for the test just concluded, the average of the whole competition being 202·9 as against 205 last year The excessive wet weather at the commencement of the competition, also during February of this year, no doubt influenced this result to some extent, as egg production during these periods was slightly lower than for the corresponding months in the previous year The highest group tally is also twenty-six eggs below last year's results. Again only two hens passed the 300-egg mark, both Black Orpingtons, one owned by Mr. Tennent laying 310 eggs and one owned by Messrs Judson and Son laying 301 eggs.



Mr. W. W. Tennent's Black Orpington Hen.

This bird won the prize for the greatest number of eggs laid by an individual hen (heavy breeds), laying 310 eggs

An interesting feature of the test is that White Leghorns put up the highest group score, as was the case last year. There was a very close contest for first place, and it was not until during the last two weeks, when Mr. F. T. Turner's group shot ahead, that it became apparent which would head the list Mr. Turner's pen won the Grand Champion prize for the group whose eggs were of the highest market value and were of the prescribed weight of

at least 24 ozs. per dozen. Mr. Tennent's birds followed the leading group closely, being only 4s. 2d. behind, and as mentioned, one of Mr. Tennent's birds put up the highest individual score, having laid 310 eggs in the 357 days of the test. In the Light Breeds sections, the highest score was 294 eggs, laid by one of Mr. B. Clarke's group.

The Metropolitan Meat Industry Board's Golden Egg trophy, valued at £25, again goes to Messrs. C. Judson & Son, whose pen led by 4½ points. This is the second time in succession that Messrs. Judson and Son have won this much coveted trophy, and they are to be congratulated upon their success and consistency. The W. H. Paine Special Prize of £10 10s. was won by Mr. F. T. Wimble, who also carried off this prize last year. Mr. I. Lowery's pen followed closely, being only 2¾ points behind.

It is regretted that no improvement was shown in the average weight of eggs, which was 25½oz. and 25 oz. per dozen for the light and heavy breeds respectively. In view of the increasing number of small eggs coming on to the market this is a matter which should not be regarded lightly, and every endeavour should be made by poultry farmers whose hens are laying eggs below standard to start in the coming breeding season to effect some improvement.

Features of the results of this competition which should encourage poultry farmers are the higher average price of eggs, which is 1s. 10d. against 1s. 8½d. last year, and the lower cost of feeding, which is shown as 9s. 7d. compared with 11s. in the previous test.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.
Trangie (F. H. Hales)	May	15, 16
Warren	,,	24, 25
Narrandera Sheep Show	July	18
Forbes Sheep Show (K. O. Anderson).	,,	18, 19
Peak Hill (T. Jackson)	,,	24, 25
Tullamore (A. N. Cornett)	Aug.	1, 2
Trundle (W. P. Forrest)	,,	7, 8
Cootamundra Sheep Show (R. D. Beaver).	,,	8, 9
Condobolin (J. M. Cooney)	,,	14, 15
Gilgandra (G. Christie)	,,	14, 15
Illabo (R. Day)	,,	15
Cargellico	,,	21, 22
Wagga Wagga (F. H. Croaker)	,,	21, 22, 23
Bogan Gate (J. Egan)	,,	22
Ungarie	,,	28
Grenfell	,,	28, 29
Parkes (L. S. Seaborn)	,,	28, 29
Junee (G. W. Scrivener)	,,	28, 29
Forbes (K. O. Anderson)	Sept.	4, 5
West Wyalong (A. Andrew)	Sept.	4, 5
Young (T. A. Tester)	,,	5, 6
Cowra (E. P. Todhunter)	,,	11, 12
Ganmain (C. C. Henderson)	,,	11, 12
Albury	,,	11, 12, 13
Barmedman (S. S. Pembethy)	,,	12
Canowindra (W. E. Frost)	,,	18, 19
Murrumburrah (W. Worner)	,,	18, 19
Temora (A. D. Ness)	,,	18, 19, 20
Boorowa (W. Thompson)	,,	20, 21
Melbourne Royal	,,	20 to 29
Barellan	,,	26
Hillston (S. Peevers)	,,	28
Ardlethan	Oct.	3
Quandialla (V. Talbot)	,,	3
Narrandera (J. D. Newth)	,,	9, 10
Ariah Park (Mort Collings)	,,	10
Bribaree (Jesse Austin)	,,	10
Griffith (W. Sellin)	,,	16, 17
Cootamundra (R. D. Beaver)	,,	23, 24

The Construction of Corrugated Galvanised Iron Tanks.

A. W. STEENE, Overseer, Parramatta Gaol.*

In the construction of corrugated galvanised iron 24-gauge iron is generally used, and it can be procured already curved to the sizes required. For a tank of 200 gallons capacity, two sheets 10 feet long would be necessary, curved to a full circle and joined by a 4 inch lap (*see* Fig. 1).

The method most often adopted in rivetting the seams, is to clamp a small hand-vise at the top and bottom, then put in a couple of rivets at each end, after which the hand-vises may be removed. Small galvanised roof bolts can also be used to hold the iron in position.

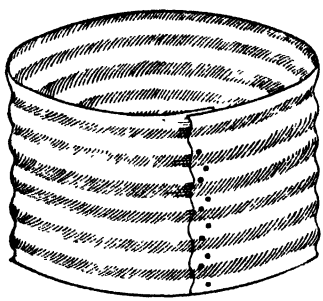


Fig. 1.

The holes for the rivets are punched from the outside, a piece of hardwood being held on the inside as a "dolly;" the rivets are distributed about 2 inches apart, or one to each corrugation. The rivets are put in the holes from the outside, an iron dolly being held to the heads, the washers placed in position and the rivets hammered down and snapped on the inside.

The second cylinder of the tank is fastened at the top, and then placed over the first cylinder (*see* Fig. 2), and lowered until the required lap is reached; one or one-and-a-half corrugations should be sufficient in a small tank. A rope is then passed round the body of the tank, with a short piece of pipe to form a tourniquet or twitch, and this is tightened until the seam is in position (*see* Fig. 3). Punching and rivetting is then proceeded with.

A tank that consists of two sections only, should have the vertical seams on opposite sides. Taking the line of the corrugations as a guide, the joint round the centre of the tank is easily adjusted, and should have a single line of rivets about 8 inches apart.

The next operation is to turn a flange on the body of the tank in preparation for the fitting of the bottom. This is done as shown in Figs. 4 and 5. As the tank now stands, the top or outside cylinder will be that to which the

* Mr. N. L. Jones, Supervising Architect to the Department of Agriculture, has endeavoured for some time to obtain information that would enable farmers to construct corrugated galvanised iron tanks for themselves, and thus reduce cost and save the heavy freight charges on such bulky articles. The article by Mr. Steene has been supplied through the courtesy of the Comptroller-General of Prisons.—Ed.

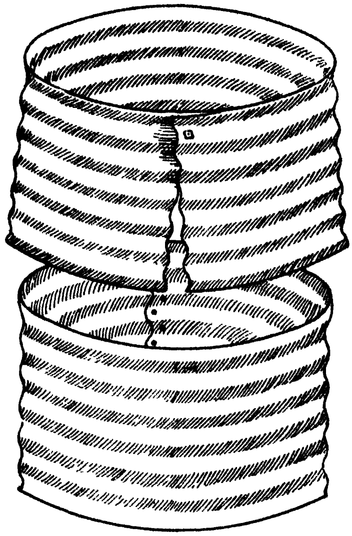


Fig. 2.

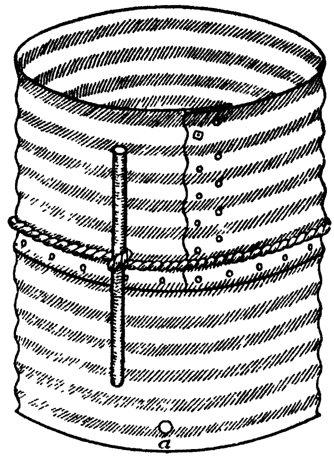


Fig. 3.

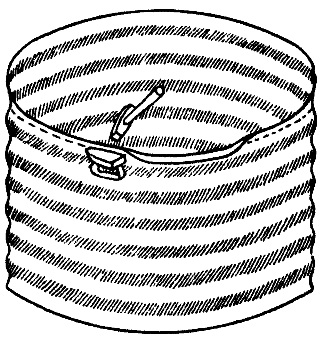


Fig. 4.

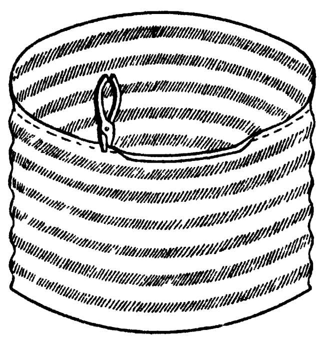


Fig. 5.

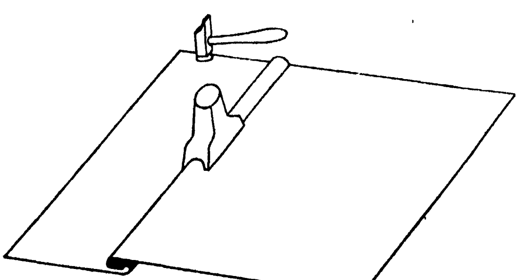


Fig. 6.

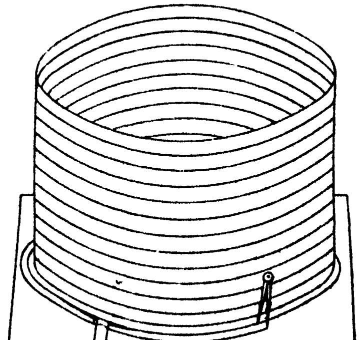


Fig. 7.

bottom is fitted. A line is drawn half an inch from the top edge, and the flange beaten over on a "hand-stake." Where this tool is not available, an ordinary laundry flat iron makes a very good substitute. For the bottom, one sheet of 24 gauge galvanised flat iron, 72 × 36 inches, will be required. As this sheet will not be wide enough for the full diameter of the tank, it will need to be cut and joined together by a grooved seam (*see* Fig. 6). To torm the seam a $\frac{5}{16}$-inch seaming tool or groover is used, the raised side of the seam being kept on top to go inside the tank. To insure a neat fold round the bottom it is necessary that the grooved seam be thinned down at each end (*see* Fig 8).

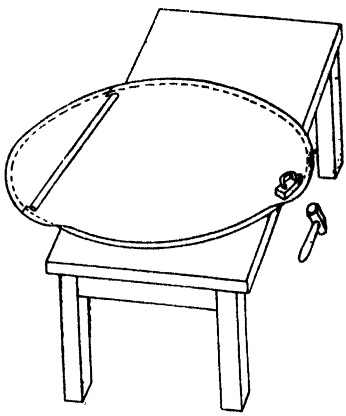


Fig. 8.

The tank is then turned over, and the flanged end laid on the sheet of iron, and scribed round with a small pair of compasses (Fig. 7), a margin of $\frac{3}{8}$-inch being allowed for the turn-up. This method of striking out a tank bottom is usually adopted when compasses sufficiently large are not available. Care should be taken in the operation, as if the measurements are not fairly accurate, buckling and distortion may occur later.

The bottom being cut out, it is now placed on a bench, and flanged to the line previously marked. This is done by placing the flat iron on the line, and beating the marked margin up to nearly a right angle, as shown in Fig. 8. Then the body is fitted to the bottom as in Fig. 9, and the flange closed down as in Fig. 10. A hole should be punched for the tap near the bottom of the tank (*see* Fig. 17), large enough to allow a $\frac{3}{4}$ inch water pipe socket to enter. A 2 inch hole is also cut close to the top for an overflow outlet (Fig. 17). The top edge of the tank may now be flanged over, as was previously done for the bottom.

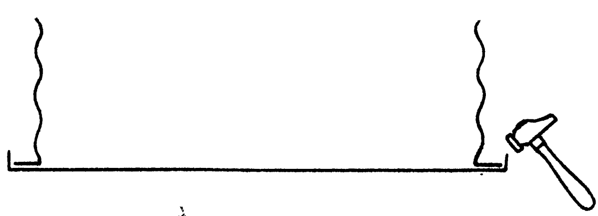


Fig. 9.

Fig. 10.

For the lid, one sheet of 26-gauge galvanised plain iron 72 × 36 inches will be needed, and this should be cut and joined with a grooved seam as with the bottom (Fig. 6), or rivetted as in Fig. 11.

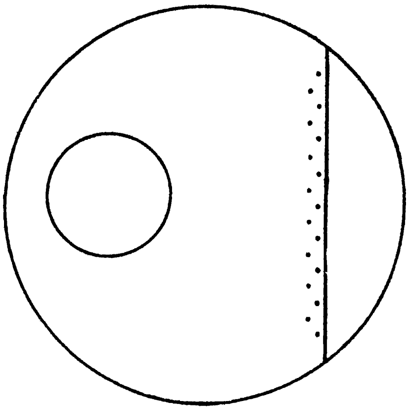


Fig. 11.

The lid is marked out as in Fig. 7 and a 15-inch circle struck for the mouth or manhole; this can be placed in the centre or near the side as required. The flange is then beaten up as in Fig. 8.

Around the mouth a strengthening collar is usually placed, this is made by taking a strip of plain galvanised iron about 2 inches wide, and of a length sufficient to circle the opening and allow of a 1-inch overlap, and cut as in Fig. 12. It is now turned up as in Fig. 13, and a rod of ¼-inch round iron of similar length is enclosed (Fig. 14), three quarters of an inch of the round iron being left protruding at the lap end to strengthen the joint. Next, round the collar up as shown in Fig. 15, and secure with a small rivet. Insert the collar in the mouth, and beat the flange over, as in Fig. 16.

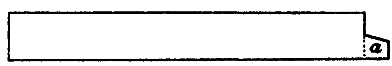


Fig. 12.

Fig. 13.

In fitting the lid to the tank, the same procedure is followed as with the bottom. Fig. 17 shows the lid in position. A moveable strainer is usually let into the mouth of the tank (*see* Fig. 20).

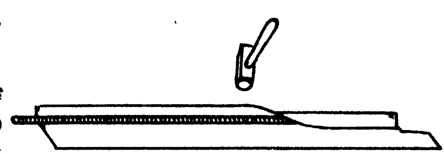


Fig. 14.

A brass ¾-inch low pressure or range tap will be required. The ¾-inch socket is now inserted about a quarter of its length in the hole already made, and soldered firmly in position. The socket is supported by a boss (*see* Fig. 18) which is easily made from a piece of plain galvanised iron, 9 inches × 4 inches; cut a hole 1¼ inches diameter, and then shape as shown in Fig. 19, by bending along the dotted lines. The boss will then have a rough

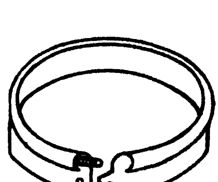


Fig. 15.

resemblance to a funnel, the small end being made to fit tightly around the end of the socket, and the other end trimmed to the contour of the tank (*see* Fig. 17). Then solder the boss securely to the tank, also along the joint, and round the socket.

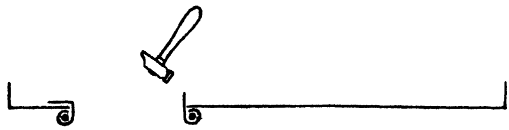


Fig. 16.

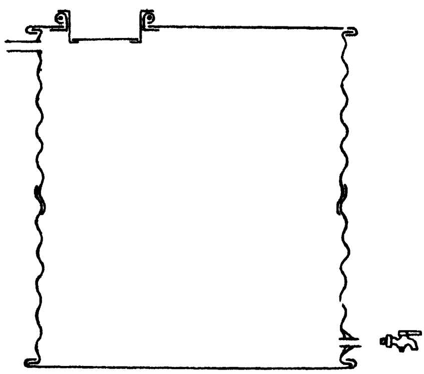


Fig. 17.

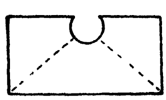


Fig. 18.

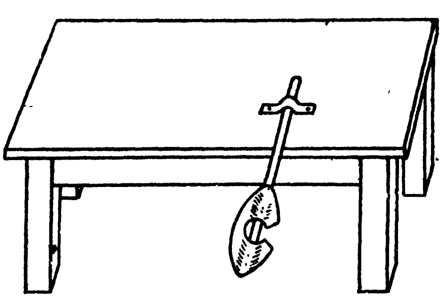


Fig. 19.

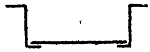


Fig. 20.

There remains now only the soldering to complete the tank. For this a fairly heavy soldering iron, weighing not less than 2 lb. should be used. All rivet heads and seams on the outside of the tank must be carefully soldered, extra care being taken with the bottom. Finally the tap may be screwed into place.

About 4 lb. of solder will be required for the above tank, and 4 lb. of rivets and washers. The rivets used are the ordinary galvanised tank rivets with round heads, and they are usually sold with the washers.

Fig. 21 shows the tools required. A rivetting hammer and a 2-lb soldering iron will also be necessary.

The foregoing details can be applied in constructing tanks of all capacities.

When building tanks of more than 4 feet high, the vertical seam on the third cylinder should be over that of the first cylinder (*see* Fig. 22).

Tanks of 800 gallons and upwards should have a lap of two corrugations around the body, and a double ring of rivets (*see* Fig. 22).

The following is a description of the materials necessary in the making of tanks up to 1,000 gallons.

The 200-gallon tank has already been dealt with.

400 GALLONS: SIZE, 3 FEET 9 INCHES DIAMETER × 6 FEET HIGH.

6 sheets galvanised corrugated iron 6 feet × 24 gauge, each curved to half a circle.
1 ,, ,, plain iron 6 feet × 3 feet × 24 gauge.
1 ,, ,, ,, ,, 6 feet × 3 feet × 26 gauge.
About 6 lb. solder, 6 lb. rivets and washers.

600 GALLONS: SIZE, 4 FEET 4 INCHES DIAMETER, × 6 FEET HIGH.

6 sheets galvanised corrugated iron 7 feet × 24 gauge, each curved to half a circle.
2 ,, ,, plain iron 6 feet × 2 feet × 24 gauge.
2 ,, ,, ,, ,, 6 feet × 2 feet × 26 gauge.
6 lb. solder, 6 lb. rivets and washers.

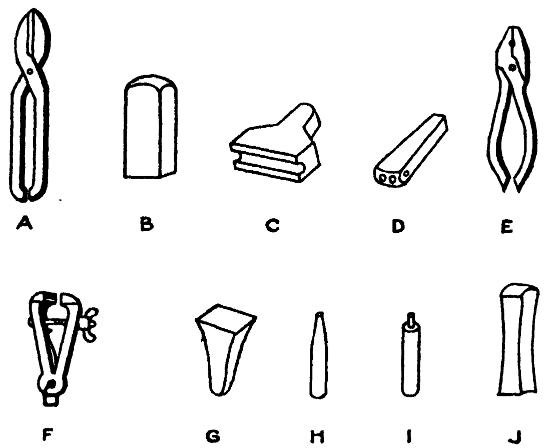


Fig. 21.

800 GALLONS: SIZE 5 FEET 3 INCHES DIAMETER × 6 FEET HIGH.

3 sheets galvanised corrugated iron 8 feet × 24 gauge, each curved to half a circle.
3 ,, ,, ,, ,, 9 feet × 24 gauge, each curved to half a circle.

Note.—Join one 8 feet sheet and one 9 feet to form a circle.

1 sheet galvanised plain iron 6 feet × 2 ft. 6 in. × 24 gauge.
1 ,, ,, 6 feet × 3 feet × 24 gauge.
1 ,, ,, 6 feet × 2 ft. 6 in. × 26 gauge.
1 ,, ,, 6 feet × 3 feet × 26 gauge.
7 lb. solder, 7 lb. rivets and washers.

1,000 GALLONS: SIZE 6 FEET DIAMETER × 6 FEET HIGH.

3 sheets galvanised corrugated iron 9 feet × 24 gauge each curved to half a circle.
3 ,, ,, ,, 10 feet × 24 gauge each curved to half a circle.

Note.—Join one 9 feet sheet × one 10 feet to form a circle.

2 sheets galvanised plain iron 6 feet × 3 feet × 24 gauge.
2 ,, ,, 6 feet × 3 feet × 26 gauge.

For each tank a $\frac{3}{4}$-inch tap and socket will be required. If a quick delivery is desired in the larger tanks a 1-inch tap and socket could be fitted.

A Few Hints on Soldering.*

The materials necessary for soldering work are the soldering iron before mentioned, a quantity of solder consisting of equal parts tin and lead, a bottle of muriatic acid (spirits of salts), and a small block of sal ammoniac. A handy container for the fire in which to heat the irons can be made out of an empty benzine tin or oil drum, by cutting out the top, punching a few holes in the bottom and cutting a hole in the side within an inch or so of the bottom, so that the heads of the irons can be passed through into the fire.

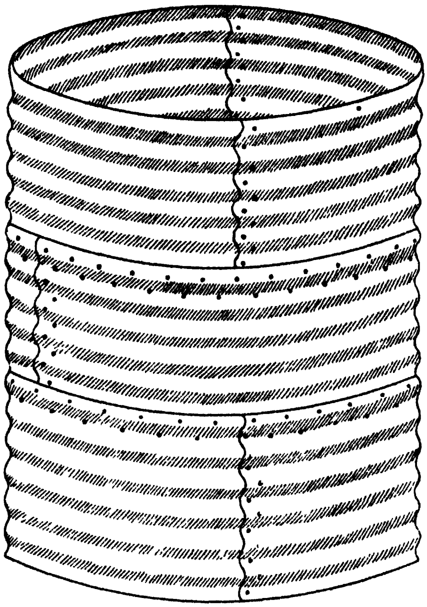


Fig. 22.

To prepare to solder, pour into a bowl (glass or ware—not tin or galvanised iron) a quantity of the spirits and add a few pieces of zinc to "kill" the liquid. The soldering iron is first heated to a dull red heat, a fair portion of the point is filed cleaned, and this portion (while the iron is still hot) is rubbed with the sal ammoniac. The clean point is then tinned—that is, coated with solder, and this is of great importance if good work is to be performed later. To tin the iron, run a little solder on to a piece of clean tin, alternately turning its point in the melted solder and dipping it in the killed spirits.

Before using the soldering iron clean the joint to be soldered, and with the aid of a brush put on a little of the killed spirits. The iron should be hot enough to make the solder run freely, but do not let it get red-hot. Withdraw it from the fire, brush the point with a piece of bagging, and dip it in the prepared spirits; then place the point of the iron on the joint to be soldered and move it slowly along, supplying solder as required by placing the end of the solder stick against the iron near the point. When soldering a loose patch, it will be found convenient to run a drop of solder on to the joint first, then hold the patch firm with the aid of the solder stick while the iron is operated to make the patch firm. The edges of any joints to be soldered should be fitted neatly and closely together, and the solder should run freely and adhere almost as if it were part of the tin.

* Extracted from an article by Mr. W. A. Goodacre, Senior Apiary Inspector, *Agricultural Gazette*, December, 1921.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bald Early	Manager, Experiment Farm, Trangie.
Bena	H. J. Harvey, Kindalin, Dubbo.
	T. Jones, Birdwood, Forbes.
	Hobson Brothers, Glenlea, Cunningar.
	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	N. G. Bourchier, Deniliquin-road, Finley.
	Smith Bros., Hillside, Harden.
	Manager, Experiment Farm, Cowra.
Cadia	Manager, Experiment Farm, Bathurst.
Canberra	E. J. Johnson, "Iona," Gunningbland.
	Quirk and Everett, "Narrawa," Wellington.
	W. A. Southwell, Wilgrove, Galong.
	T. Jones, Birdwood, Forbes.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Bathurst.
Cleveland	W. Burns, Goongiwarrie, Carcoar.
	Manager, Experiment Farm, Bathurst.
Currawa	Quirk and Everett, "Narrawa," Wellington.
Duri	R. Penfold, "Edaville," Quandialla.
Federation	E. J. Johnson, "Iona," Gunningbland.
	H. Owen, "Apple Grove," Duri.
	W. R. Carter, Allambie, Narromine.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle-road, Parkes.
	N. G. Bourchier, Deniliquin-road, Finley.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Bathurst.
Firbank	Manager, Experiment Farm, Trangie.
Florence	Manager, Experiment Farm, Trangie.
Gresley...	H. J. Harvey, Kindalin, Dubbo.
Hard Federation	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Bathurst.
Improved Steinwedel ...	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, Linden Hills, Cunningar.
Merredin	T. W. O'Brien, "Cooberang," Junee Reefs.
Nabawa	Cullen Bros., Bunglegumbie, Dubbo.
Nizam	N. G. Bourchier, Deniliquin-road, Finley.

Wheat—continued.	
Riverina	Quirk and Everett, "Narrawa," Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
Turvey	Quirk and Everett, "Narrawa," Wellington.
	T. M. Slattery, Mirrool.
	Hobson Brothers, Glenlea, Cunningar.
	W. G. Law, Wattle Park, Armatree.
	Hannett Bros., "Bonefoi," Cunningar.
Union	H. J. Harvey, Kindalin, Dubbo.
Waratah	E. J. Johnson, "Iona," Gunningbland.
	P. Page, Duri.
	Quirk and Everett, "Narrawa," Wellington.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	T. W. O'Brien, "Cooberang," Junee Reefs.
	J. McGrath, "Berra Lea." Goonumbla.
	Maguire and Fehon, "Aorangi," Barmedman.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	Chaffey Bros., Nemingha.
	Manager, Experiment Farm, Trangie.
	T. Jones, Birdwood, Forbes.
	B. J. Stocks. Linden Hills, Cunningar.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	A. Milgate, Trundle Road, Parkes.
	J. Berney, "Kildara," *via* Cumnock.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Temora.
Wandilla	Manager, Experiment Farm, Temora.
	P. Gaynor, "Underwood," Ariah Park.
Yandilla King...	A. A. Groves, "Aberfeldie," Barmedman.
	Quirk and Everett, "Narrawa," Wellington.
	Cullen Bros., Bunglegumbie, Dubbo.
	G. C. Chapple, "Ondiong," King's Vale.
	Bradford Brothers, Nubba.
	Hobson Bros., Glenlea, Cunningar.
	T. M. Slattery, Mirrool.
	R. A. Harricks, Horseshoe Vale, Dubbo.
Oats—	
Algerian	J. Lyne, Farm 1636, Yenda.
	W. H. Swain, Riverview, Peak Hill.
Barley—	
Cape	Manager, Experiment Farm, Bathurst.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Citrus Bud Selection in the United States.

The work of A. D. Shamel on this matter is classic, and no one [in California] would now propagate citrus trees except from pedigree stock. Further, in many orchards, a continuous record is kept of the performance of each tree, and those that do not yield fruit of satisfactory quality or in sufficient quantity are chopped out or cut back and re-budded with buds from trees of proved performance. So universal is the demand for pedigree buds that the Fruit Growers' Supply Company of the California Fruit Growers' Exchange, has a special department for selecting and supplying these buds. The price is 60.00 dollars (£12 10s.) per thousand to non-members and 50.00 dollars (£10 8s. 4d.) per thousand to members.—From the report on an Investigation of American Fruit Methods by W. Granger, Direction of Fruit Marketing, Brisbane.

Poultry Notes.

May.

E. HADLINGTON, Poultry Expert.

Selection as the Basis of Breeding Poultry.*

DURING the past twenty years poultry-farming in this State has grown from a haphazard proposition that was looked upon as a side-line or adjunct to other classes of farming, to a sound specialised industry, the products from which are worth close upon £4,000,000. There is, however, a weakness which is becoming manifest. In the effort towards increasing the number of birds kept and in striving for higher egg-production, the important matter of breeding to keep up stamina and breed character is being neglected. The result is reflected in the number of eggs under first-grade standard which are coming on to the market. These small eggs are largely the product of birds lacking in size and stamina, and the time has arrived when more attention must be given towards the improvement of our flocks if we are to maintain their productive ability and improve the size of the eggs.

Improved Methods of Breeding.

In years gone by there was a proportionately greater number of breeders of standard quality birds than there is at present, and there was very keen competition in the breeding of birds to keep up the type and size of the breeds. Although many of these so-called "fanciers" were not much concerned about egg-producing ability, there were others who looked to their birds to pay from a productive point of view as well as by the prize-money. These breeders spent a lot of money on the importation of stock, and brought much skill to bear upon breeding high-class birds, which spread throughout the State, and played an important part in helping to improve the flocks on the commercial farms. Unfortunately, with the rapid growth of the commercial side of poultry-farming, there has not been a corresponding increase in the number of these specialised stud-breeders, and to-day there are too few stud farms where birds are bred to a sufficiently high standard.

With the expansion of the industry there is need for a greater number of farms where the skill of the standard breeder is exercised in breeding for quality and egg-production combined. This can only be brought about by a demand for better quality birds. Fortunately, there is evidence of such a demand from some farms, and also in the higher standard of quality shown in the utility classes of this show. But a more general recognition of the necessity for improvement in breeding is essential to achieve the desired result.

Study the Standards.

One of the first considerations in breeding should be a working knowledge of the standard for the breed kept. Each breed has a definite type standard which, apart from colour, distinguishes it from the others, and a knowledge

* Notes of a lecture delivered at the Royal Agricultural Society's Show, April, 1928.

of this standard is necessary before uniform matings can be accomplished. It would not be a difficult matter for any poultry-farmer to acquaint himself with the essential points of the standard of his breed, such as shape, general conformation, and the weights required, and the main defects which should be avoided. He would, of course, not be so much concerned with the finer points looked for in the show pen.

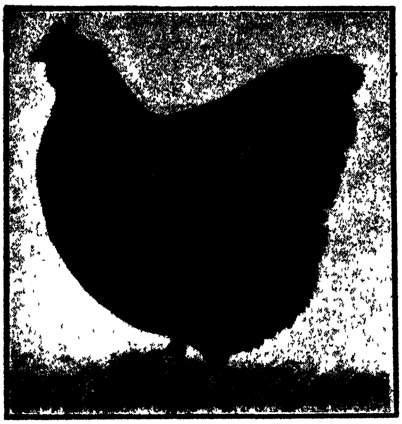


Fig. 1.—A Typical Black Orpington Hen.
Note the "cobby" outline and depth of this hen in comparison with the others on this page.

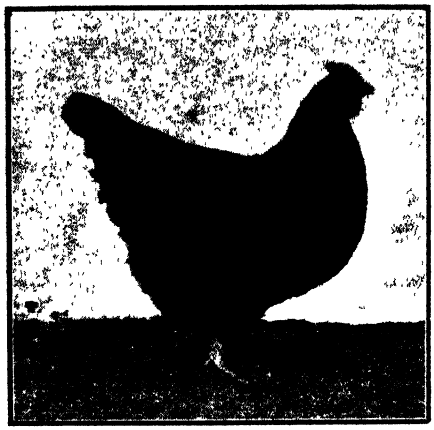


Fig. 2.—This Hen shows some Falling Away from Type.
She is less "cobby," too long in the back, and shallow in body.

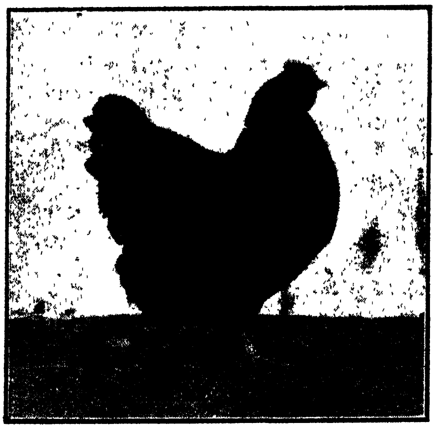


Fig. 3.—Lacking Symmetry and Character.
While more "cobby" than Fig. 2, this bird is still on a descending scale as regards quality.

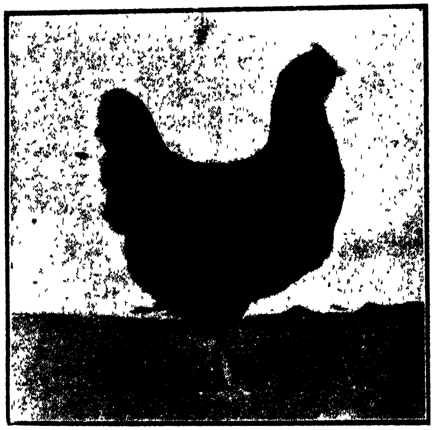


Fig. 4.—Figures as an Orpington.
Altogether lacking in type and character for the breed, and in fact nothing more than "a black hen."

The necessity for some general idea of the standard of the breeds is illustrated in the varying types of the same breeds shown in the accompanying photographs, which depict typical birds, others showing some falling away from type, and nondescript specimens. From these it will be realised how any breed would soon degenerate without due regard being given to

selection for breed characteristics. This is where the egg farmer who regards egg-production as the only consideration, is heading, and I would emphasise strongly that breeding from high producers without careful selection for type and stamina is the surest road to degeneration; selection must, therefore, form the basis of the consistent high-producing flocks.

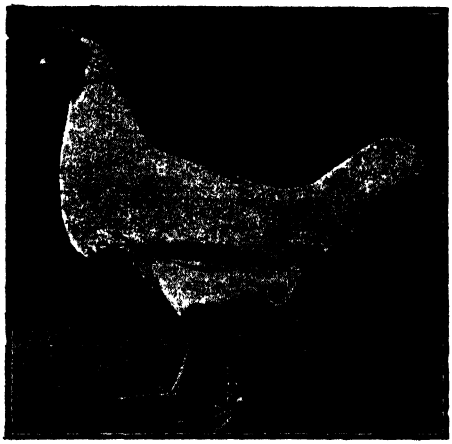


Fig. 5.—A Typical White Leghorn Hen.

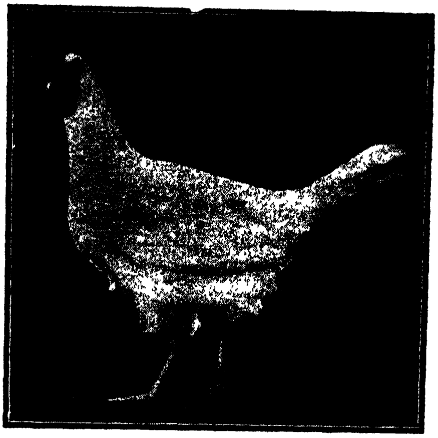


Fig 6.—This Hen Lacks Symmetry, is Whippy in Tail, and Coarse in Head Points.

Fig. 7.—This Hen is Shallow in Body Indicating Lack of Constitution.

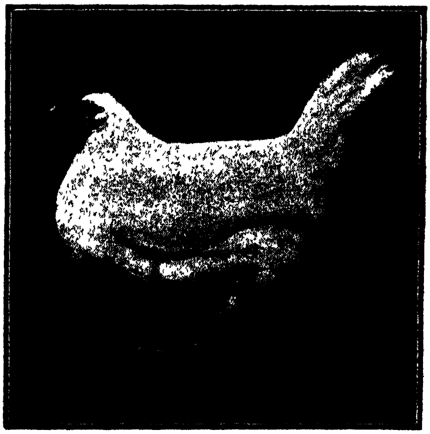


Fig. 8.—A Coarse Hen of Bad Type; Inclined to put on Flesh rather than Lay Eggs.

Note the coarseness of the head.

While not deprecating the practice of breeding from tested layers, it is necessary to draw attention to the fact that there is a tendency to breed from hens which have laid a given number of eggs, regardless of whether they are otherwise desirable for the breeding pens, or, perhaps worse still, to use male birds for breeders just because they are bred from hens which

have put up a good performance. The point is overlooked that heavy egg-production is a strain on the constitution of a hen, and for this reason the progeny of high producers may not be as robust as those of lower producers; hence the vital importance of rigid selection for stamina if high productiveness is to be maintained.

Selection by Conformation.

So much for selection for type and stamina. The next consideration is to choose birds showing the characteristics denoting laying qualities, and in this connection the head points are a good guide to productive ability. For instance, the hen or pullet which has a bright, alert appearance, together with large prominent eyes, face free from wrinkles and feathers, and fine in texture of comb and wattles will be found the most prolific. As a contrast, the poor layer has a thick skull, small, sunken eyes, wrinkled face, and is altogether coarse, heavy, and sleepy in appearance; these features should be avoided also in male birds used for breeding. A study of these characteristics, and careful selection of breeding birds on the lines indicated, would materially assist in improving the laying qualities of a flock.

A knowledge of selection on these points is also of great value in culling out the drones from among the layers without the necessity for testing by single pen or other means. Thus it will be seen that selection is of paramount importance, not only in breeding but also in eliminating the unprofitable units.

Infectious Diseases Reported in March.

The following outbreaks of the more important infectious diseases were reported during the month of March, 1928:—

Anthrax	3
Pleuro-pneumonia contagiosa	13
Piroplasmosis (tick fever)	Nil.
Blackleg	2
Swine fever	Nil.

—Max Henry, Chief Veterinary Surgeon.

To Employ Credit Intelligently.

For the intelligent employment of credit facilities a farmer should know two things—(1) what credit costs, and (2) what it earns when applied to the farm. Otherwise he cannot measure how much credit he can profitably employ. The first condition is fulfilled where a definite rate of interest is charged upon loans, as in the case of the banks; the second should be fulfilled as far as possible by the application of cost accounting to the farm.—R. R. Enfield, in "Report on Agricultural Credit," Ministry of Agriculture, England.

Orchard Notes.

May.

C. G. SAVAGE and W. LE GAY BRERETON.

Pruning.

WITH the exception of some growers of the very late apples in the tableland districts, deciduous growers will have completed handling their crop, and the next main job will be pruning.

In many districts some of the stone fruits reach their dormant stage in May, but it is still an open question whether the tree pruned so early is more liable to start into activity again than the unpruned tree, if an abnormally warm period should follow. Experiments carried out by this Department over several years yielded varying results, and merely showed that another factor, or perhaps several factors during the seasons the experiment was conducted, had a greater controlling influence than pruning on this point.

However, when only a limited number of pruners are employed in comparison with the work to be completed, it is generally the best policy to get an early start, especially if dry weather is experienced during the early part of the winter. Far too often pruning is postponed too long, with the result that it clashes with the ploughing that should be carried out during the later months of the winter. This congestion, of course, becomes more aggravated if much wet weather is experienced during the latter part of the winter.

To economise in time, a start should be made on those stone fruits which are the first to start into growth in the spring. A leaflet on the pruning of deciduous trees is obtainable free from the Under-Secretary, Department of Agriculture, and a book giving greater detail is on sale at 3s. 3d., post free.

Planting.

As pointed out in these Notes earlier, it is a good plan to plough and subsoil land for planting some months beforehand, as by so doing one can be tolerably certain of having it in moist enough condition when required. The final preparations can now be made, and an endeavour made to put the fine soil underneath in a firm condition. June is a good time for planting deciduous trees, as by getting them in early the new root growth, which starts long before the top makes any external perceptible sign of moving, is made in the permanent location of the tree.

When laying out for planting, do not be tempted to crowd the trees; give them plenty of room. A leaflet on the laying-out and planting is also obtainable free from the Department.

Pests.

A thorough clean-up of the packing-shed should be made before closing it down at the end of the packing season. All cases or other receptacles that have held fruit should be dipped under boiling water for not less than

three minutes, and any sacking used on packing benches should be similarly dipped, or if valueless, burned. All cracks and holes in benches or other packing-house appointments should be probed, and any lurking codling or other injurious insect larvæ killed. At all times the sweepings from a packing-shed should be thrown on to a fierce fire. Codling moth bandages are best left on the trees till well into the winter.

Pruning operations offer the best opportunity for a close tree to tree scrutiny for pests such as San Jose scale. Affected trees should be marked for future treatment.

Raising Seedling Stock.

As the Department had had many inquiries concerning seedling stock for apple trees, directions for raising apple seedlings were given in this *Gazette*, December, 1927, page 939. In that article some results were quoted from the *Journal of Agricultural Research* of an investigation carried out by G. T. Harrington and Bertha Hite of the United States Department of Agriculture. A later investigation on the storage and germination of apple seeds has been carried out by A. T. Bakke, H. W. Richly and Kenneth Reeves of the Iowa State College of Agriculture. Their results confirmed those of Harrington and Hite concerning the importance of not allowing the seeds to dry out during storage, and established the most favourable temperature for storage to be between 1 and 3 deg. Cent. (34 to 37 deg. Fah.); the previous investigators had shown that apple seeds after-ripen in a few months when kept moist at a temperature between 5 and 10 deg. Cent. (41 to 50 deg. Fah.), and that they also after-ripen within the fruit at 0 deg. Cent. (32 deg. Fah.).

THE VITALITY OF BURIED SEEDS

FROM time to time the story of the growing of prehistoric wheat grains from Egyptian tombs is repeated, and not always without receiving credence. While we need not pause to consider the longevity of seeds in terms of centuries, to have some estimate of it in years is at once interesting and important. The seed of most of our crop plants retains viability but a few years. Four years' storage reduces the germination capacity of many common crops to 50 per cent. or less. . . . A recent paper by Goss furnishes evidence of much interest. In 1902 seeds of 107 species of plants were buried in the soil at three depths—8, 22, and 42 inches. Samples were dug up after intervals of one, three, six, ten, sixteen, and twenty-one years. In general, deterioration of the seeds was found to be more marked at a depth of 8 inches than at 22 or 42 inches. Between these last two depths differences were small. For no less than fifty-one out of the 107 species of plants tested some seeds were found to be alive at the end of twenty-one years. Of these fifty-one species there were twelve of which living seed was found at all three depths. Among these twelve was a solitary crop plant—tobacco—the rest being species of weeds.—F. L. ENGLEDOW, in "Agricultural Research in 1926."

CONTENTS.

VOL. XXXIX. PART 6. JUNE 1, 1928.

Agricultural Gazette of New South Wales.

The Science of Fallowing.

H. C. STENING, H.D.A., Chief Instructor of Agriculture *

THERE is no phase in modern farming practice that deserves more attention than the problem of how to maintain an adequate supply of moisture in the soil. It is lack of sufficient moisture at the right time that does more to reduce the yield of wheat crops in this State than even the lack of available plant-food. This does not refer particularly to periods of drought, such as that experienced during the last wheat-growing season, for the greatest losses from lack of moisture are not from noticeable droughts, but from unnoticed dryness that merely lessens the crops year by year, reducing the average and lowering the standard. So throughout the wheat areas the problem of paramount importance in crop production is how to supply moisture at the right time in adequate quantity, and the solution to the problem is "fallow."

Water Requirements of Crops.

It is unwise to attempt to standardise methods of fallowing, for much is dependent on factors such as climatic conditions and the nature of the soil, but an understanding of the underlying principles of the cultivation methods will enable the farmer better to apply his own judgment as to how and when the various operations should be conducted to suit his own particular conditions.

It is scarcely necessary to mention how important it is that sufficient water should be supplied to enable the wheat crop to live and grow. Water forms from 50 to 90 per cent. of green plants, and a considerable portion of the dry matter of the plant is produced from water and carbonic acid gas obtained from the air. But this is a mere bagatelle compared with the enormous quantity of water which is being constantly taken from the soil by the minute root hairs radiating from the roots, and which passes upward through the stem to the leaves where it is finally evaporated. This process is known as "transpiration," and many experiments have been conducted to determine the amount of water that thus passes through plants in the production of 1 lb. of dry plant substance. The transpiration is not the same for all plants, nor is it the same under all conditions for the same plant. Both the amount of water evaporated from the soil and that transpired by the plant leaves increase materially with an increase in the temperature during the growing period, and they are much greater under a clear sky and in districts where the atmosphere is dry—conditions which prevail in most of our wheat areas. When, late on a hot day, a crop is seen to be

* Notes of an address delivered at the Murrumburrah Agricultural Bureau Conference, March, 1928.

wilting, the rate of transpiration has exceeded the rate of supply of moisture. In the drier wheat districts it is estimated that approximately 500 lb. of water are required to thus pass through a wheat plant for the production of 1 lb. dry matter.

It would therefore take sixty times 500 lb.—or 30,000 lb.—of water to produce a bushel of wheat. But in order to produce this grain a certain amount of straw must be produced which is about half the weight of the whole plant; therefore to produce 1 bushel of wheat it takes 60,000 lb. of water, equal to 27 tons. This may appear a very large figure, but in comparison with the amount of water that falls as rain, it is not so extraordinarily large; 1 inch of rain over 1 acre weighs 101 tons. If all this could be stored in the soil and used wholly for plant production it would produce, at the rate of 27 tons of water per bushel, about 3¾ bushels of wheat. Thus 10 inches of moisture represents 37 bushels. It is impossible, however, to bring all the rain that falls into the soil and store it for plant use, and it is not possible to treat soil so that all the stored moisture may be used for plant production; for instance, some must of necessity be evaporated directly from the soil. Experiments have shown, however, that it is feasible by cultivation methods to conserve half the rainfall, so that the yields mentioned are possible every other year. This may be regarded as the theoretical basis of fallowing; it is not to be expected that things will work out so exactly, but the above gives some idea of the maximum possibility.

Successful fallowing depends chiefly upon the success with which the rains that fall during any season of the year are stored and kept in the soil until needed by the plants in their growth. The rain that falls on the land is disposed of in three ways; under ordinary conditions a large portion runs off without entering the soil; secondly, a portion enters the soil but remains near the surface and is rapidly evaporated back into the air; thirdly, a portion enters the lower soil layers from which it is removed at later periods by different processes. The run-off is usually large and is a serious loss, especially in undulating country, and in dry districts owing to the hard, sun-baked nature of the soil; this run-off is greatly diminished by cultivation, but it is not possible wholly to prevent it under any conditions.

Capillary Moisture.

If, as a result of proper ploughing and cultivation, the upper soil is loose and porous, the rain is allowed to soak quickly into the soil away from the action of the wind and sun; from that temporary reservoir the water will move slowly downward in obedience to the pull of gravity to the greater soil depths where it may be stored until needed by the crop, in the form of a thin film of moisture around the soil grains. This water is known as capillary water. It cannot be seen as a liquid, but its presence may be recognised by its effect upon the colour of the soil. It is capillary water alone that is of value in crop production, and it supplies the wheat plant with water containing dissolved food constituents necessary for its growth. If a

stone is immersed in water and withdrawn it is surrounded by a film of moisture which clings to the surface; if a handful of gravel is treated in the same manner, a film of moisture surrounds each piece of gravel, but it is obvious that owing to the greater surface area the gravel will retain more water than a stone of the same size. So too, the finer the soil grains, the greater the water-holding capacity. Soil is composed for the most part of particles of disintegrated rock which vary greatly in size, the largest often 500 times the size of the smallest, and of which as many as 15½ billions of particles may be contained in a cubic inch. This very large number of soil grains found in a small amount of soil makes it possible for the soil to hold very large quantities of capillary water. The surface area around which moisture can cling in a cubic foot of soil has been carefully estimated at from a quarter of an acre to 4 acres. The thickness of the film is very minute, but spread over such a large area it is clear that the total amount of water involved must be great. It has been calculated that in average soils 2 to 3 inches of water can be stored in the soil to a depth of 12 inches—that is 20 to 30 inches to a depth of 10 feet. It will be seen, therefore, that there is ample storage capacity in the soil, and the farmer should endeavour to have his soil well supplied before the crop is sown.

The soil grains do not fill the whole soil space; the tendency is rather to form clusters of soil grains, which, though touching at many points, leave empty spaces. This pore space varies greatly, with a maximum of about 55 per cent. The best conditions for plant growth are when half the pore space is occupied by water and the other half with air, that condition being also most favourable to the development of bacteria, those micro-organisms which are constantly working for the farmer in the production of nitrates from organic matter. The more the particles are compacted, the greater the quantity of water the soil is capable of holding.

In southern districts the best time for storing moisture in the soil is during the winter months; rainfall is then greatest and the rate of evaporation is lowest during this portion of the year. In order to allow these rains to penetrate readily into the soil and not be lost as run-off or by evaporation, the land should be ploughed early in the winter. In fact, ploughing should commence immediately on the completion of sowing operations, and every opportunity should be taken to proceed with it while the soil is in a satisfactory condition. The more loose and open the soil is the more rapidly will the rains be absorbed. It is an advantage therefore, to leave the soil "in the rough" during the winter months, as it is then in a more receptive condition; and it also allows of a greater exposure of the soil mass to the disintegrating and mellowing effects of air, frost, rain, and sun.

It has been noted that it is only when the subsoil is tolerably moist that the rain will move rapidly and freely to the deeper soil layers, the water being allowed, as it were, to slip down more easily. There is a repelling action between dry soil and water, and when the soil is dry the downward

movement is much slower, and the bulk of the water is stored near the surface where the evaporation of water goes on rapidly. It is therefore undesirable to allow the soil in dry areas to become very dry, especially below the first foot. Many farmers are now adopting the practice of cultivating the land intended for the fallow as soon as possible after the harvest, the system being known as the "long summer fallow." By this means any moisture left in the soil after harvest is conserved, and the autumn and winter rains are permitted to sink readily in the soil, moving away from the top soil.

Water Dissipating Forces.

Getting the moisture into the soil is only the first step towards making the rains of the previous year available for crop growth. It is necessary for the farmer to use all precautions to keep the moisture stored in the soil until required by the crop, for as soon as warm weather approaches, water-dissipating forces come into play and soil water is lost by evaporation. Whenever water is freely exposed to the air it evaporates, that is, it passes into a gaseous state When the air contains all the water possible it is said to be "saturated" and evaporation ceases The more the air is charged with moisture the slower is the evaporation, as is instanced by the fact that clothes dry more rapidly in the interior than on the coast where the air is moister The amount of water necessary to saturate the air varies greatly with the temperature—as the temperature increases the amount of water that may be held by the air also increases. This is why we hang clothes near a fire when we wish to dry them quickly. At a temperature of 100 degrees Fahrenheit a given volume of air can hold more than nine times as much water as at a temperature of freezing point This is important, for it explains the greater facility of storing water during winter when temperatures are low and moisture more abundant, and it also emphasises the fact that in hot weather every precaution must be taken to prevent evaporation of soil moisture.

Very humid weather was recently experienced in Sydney, and on one very still day the humidity of the atmosphere was reported to be 99 per cent., but it must be understood that the atmosphere as a whole never reaches saturation point, though it sometimes occurs locally For instance on a still, hot day the layer of air immediately over a field containing much water may become saturated and into this layer very little water will evaporate. But whenever the air begins to move and the wind blows, the saturated air becomes mixed with drier air and evaporation again increases. Winds, therefore, are one of the farmers' greatest enemies.

In addition to low rainfall in dry districts, these evaporating factors are very great and few farmers realise the immense possible annual evaporation in such areas. As a matter of fact, it is always much larger than the total annual rainfall; in the drier wheat districts of America the evaporation has been found to be six to thirty-five times greater than the rainfall. Unfortunately in this State evaporation records are available for only one centre

in the wheat areas, viz., Dubbo, where the average annual evaporation is 66 inches, or three times the average annual rainfall. At Coonamble, where little wheat is grown, it is 86 inches or nearly four and a half times the average annual rainfall. It must be borne in mind, however, that while such rates of evaporation may occur from a free water surface, that from soils under similar conditions is very much less, owing to the strong attraction between the soil and any water held as a film around the soil particles. Very much for the same reasons, evaporation goes on more slowly from water in which salt and other substances are dissolved. Soil water containing plant-food in solution evaporates more slowly than pure water. Therefore fallowing and manuring, by increasing the soluble plant-food, tend to diminish evaporation.

Evaporation from the soil takes place almost wholly at the soil surface, yet it may continue until the moisture is depleted to a depth of 8 or 10 feet. Water moves upward in the soil as readily as downwards, the process being somewhat similar to that by which oil ascends a lamp wick as the oil is consumed at the flame, fresh oil moves in to take its place. As previously explained water is held in the soil as a film about each grain of soil. The thickness of this film is the same around each particle. If for any cause (such as absorption by plant roots or evaporation) there is a diminishing of the thickness of this film about the particles in any portion of the soil, there is an immediate movement from the thicker films adjoining until there has been a complete readjustment, and the films are again all the same thickness. This movement for readjustment is known as the capillary movement of soil moisture. The thicker the films or the more moisture there is in the soil, the more rapid is the capillary action. Conversely, the drier the soil becomes the less rapid is the capillary action; in very dry soil there is little or no movement at all. Rapid evaporation from the surface of the soil causes a correspondingly rapid movement of the soil water in that direction. This is particularly true in very early spring when the soil is holding its maximum amount of moisture. At times the evaporation from the soil surface exceeds the capillary movement, and as a consequence the surface layer of soil becomes much drier than the soil below. This dry layer is an effective check to further capillary movement of the moisture toward the surface, as dry soil will admit of little or no capillary movement.

The Action of a Soil Mulch.

Capillary soil moisture moves from particle to particle until the surface is reached. The closer the grains are packed, the greater the number of points of contact and the more easily will the movement of water proceed. If a layer of soil is loosened and the number of points of contact thus reduced, the movement of water is correspondingly hindered. The breaking of the points of contact between the surface and subsurface soil is the main reason for the efficiency of cultivation in preventing evaporation. But the stirring of the soil also causes the top soil to dry out very thoroughly, and as before

explained, a layer of dry soil of itself is a very efficient check to surface evaporation. This layer of loose dry soil is known as the soil mulch. The effectiveness of soil mulches varies with the dryness of the soil, the coarseness of the soil structure, and the depth of the mulch. If a mulch once formed becomes wet and more or less runs together its effectiveness is greatly lessened because connection is re-established with the firm moist soil beneath and also because the mulch becomes wet, in which state it admits of rapid movement of capillary water. After any considerable fall of rain, therefore, the soil should receive surface cultivation to break capillary connection and facilitate rapid drying of the surface layer. Once the mulch is well loosened and dried there is nothing to be gained by further cultivation. Indeed it costs something to cultivate and when done needlessly both time and labour are a distinct loss. On the other hand, the farmer who neglects to cultivate his fallow when conditions require it, is like a man who fills a cask at the bung hole and allows the water to drip away at the spigot; he is nullifying the good work already performed.

The soil contains the greatest percentage of moisture in the spring, and delay in mulching the surface at this season, even though it be but a few days, results in a very serious loss by evaporation. The saving of moisture effected by even a slight cultivation in early spring is surprisingly great, and for this purpose the wide stretches of harrows are very useful, enabling the cultivation to be completed in a minimum of time.

The mulch should be neither too coarse nor too fine; a granular condition with small clods will give the best results. Large, hard clods of soil, such as often result from the late ploughing of the fallow, admit of too much air circulation within the surface soil and considerable loss by evaporation occurs. On the other hand, mulch that is very fine and dusty is not only less efficient than a cloddy one, but is rendered ineffective by light rain, and has a tendency to run together and set hard after heavy rain. A 4- to 5-inch mulch is no more effective than one half that depth; indeed it has a disadvantage in that it destroys the compacted subsurface soil.

It is essential that the subsurface soil be finely pulverised and firmly compacted, thus increasing its water-holding capacity and its capillarity, and placing it in the best possible physical condition for the germination of the seed and the development of plant roots. With a 2- to 3-inch mulch the seed can be sown on the moist, compacted, subsurface soil with the assurance of a satisfactory germination and a vigorous growth of the crop.

By understanding the basic principles of fallowing farmers will be better equipped to use sound judgment in performing the fallowing operations, and to conserve the maximum amount of soil moisture at a minimum of cost. The practices adopted by some farmers are based on the principles outlined above with very successful results, and if the many can be encouraged to follow the example of the few, it would not be too much to anticipate a doubling of the State's wheat yield.

The Nomenclature and Purity of Wheat Varieties.

THE POSITION NOW AND THIRTY YEARS AGO.

J. T. PRIDHAM, H.D.A., Plant Breeder.

IN 1892, Dr. N. A. Cobb (now Nematologist to the United States Department of Agriculture) was Plant Pathologist to the New South Wales Department of Agriculture, and as such attended an Intercolonial "Rust-in-Wheat" Conference held in Adelaide in that year. At that conference, a committee to deal with the nomenclature of wheats was formed, and Dr. Cobb was appointed chairman.

A report of his, written in January of the following year, has recently come under notice, which throws an interesting light on the beginnings of wheat breeding and selection work by the Department of Agriculture.

Work was commenced in 1892, when a large collection of wheats was grown by the late Mr. William Farrer, at Lambrigg, at the instance of this committee. Actually 546 samples of wheat obtained from prominent seedsmen, well-known farmers, and Government departments were grown in short rows with the object of finding out and describing the number of distinct varieties amongst them, and also of selecting plants with rust resisting qualities for breeding work.

The report goes on to state that the Intercolonial Rust Conference had appointed this committee because it became apparent to them after two years of careful inquiry that the name of a wheat was often no guarantee of its character. Outlining the condition of affairs at that time, Dr. Cobb says: "When a farmer wishes to buy seed wheat of the Purple Straw variety, he may be given under this name not less than half a dozen wheats which differ materially from each other in such important qualities as earliness, prolificness and the milling quality of the grain. There are Early Purple Straws and Late Purple Straws—some fully three weeks earlier than others. Some Purple Straws yield very much more than others, and some have grain much superior to others in milling qualities. Now the farmer, we may be sure, wishes to get the best seed wheat, but under existing circumstances he cannot be sure of anything further than this, that he gets Purple Straw, it may be good or it may be poor. . . . When we add that the chances are that the farmer will get impure seed, that is, seed containing a mixture of other varieties of wheat, it becomes clear that some remedy should be applied."

"In a considerable number of cases in this nomenclature experiment, a drill of wheat only 20 feet long contained three, and in several cases, no less than five distinct sorts. . . . In some cases, the mixture of seed was such that it was impossible to decide which plants deserved the name under which

the sample was submitted. . . . Nor is this all. Not only are several wheats often now sold mixed under one name, but the same name is in some cases applied to several totally distinct kinds of wheat, and furthermore, the same wheat is often known under more than one name."

The report finally recommends that "it is the duty of the Government experiment farms to raise and supply pure seed true to name."

The excellent position which is found in this State to-day with regard to the nomenclature and purity of seed wheat is largely due to the prompt action taken by the Department, and to its subsequent efforts to lay the foundation for pure seed production by single plant selection, and the increase of this to a supply of pedigree seed as recently described in the *Agricultural Gazette.* The maintenance of this state of affairs is assisted by greater care on the part of farmers in keeping seed pure and by a greater demand for pure seed, which has been further engendered by widespread and rapidly growing wheat competitions. The farmer has been wise in following the Department, not only in the naming of wheats, but also in its recommendations of varieties for different districts.

The seed wheat business has been largely kept out of the hands of seedsmen, many of whom are prone to bring out a new name for an old variety. The wheat grower has definitely scotched this practice with wheat, because of his close observation of varieties, and ability not only to recognise such a practice quite easily, but also to keep to a good variety once he has it.

Federation wheat was taken up quickly on its advent, but the celerity with which newer varieties, such as Canberra and Waratah, have become popular, demonstrates the confidence of farmers in the Department's productions, and its recommendations of these varieties for particular districts and purposes.

The Poisoning of Honey Bees by Common Orchard Sprays.

Recent studies made by the Massachusetts Agricultural Experiment Station have indicated that there is little danger of significant mortality of honey bees from the spraying of orchards, provided that the recommended combination of lead arsenate, lime-sulphur, and nicotine sulphate is used.

In laboratory tests, bees were strongly repelled by this regular spray combination (lead arsenate, 1½ lb. to 50 gals.; lime-sulphur. 1 to 40; and nicotine sulphate, 1 to 1,000). This mixture, however, even when consumed in minute amounts, proved to be very toxic to them, and was rapid in its killing action. Lead arsenate spray was readily accepted. A one-frame nucleus to which this was offered lost approximately one-half of its bees within forty-eight hours after feeding. Any mixture containing nicotine sulphate was very repellent to the bees, and they fed upon it but sparingly. This strong repellent action persisted for a considerably longer period in the laboratory than in field tests, and appeared to vary according to the volatilization of the nicotine.—A. I. Bourne, Massachusetts Agricultural College, in *Science Bulletin.*

Field Experiments With Cereals.

SOME REPORTS ON THE SEASON 1927–28.

Temora Experiment Farm.

K. G. CARN, Experimentalist.

IN view of the season experienced in 1927, the results obtained with wheat at Temora farm should convey some interesting knowledge to farmers in the surrounding district and those operating under similar conditions.

The total rainfall recorded from July, 1926, to November, 1927, amounted to 23·41 inches, the monthly falls being as follows:—

1926.	Points.	1927.	Points.
July ...	163	April	125
August	203	May	227
September	195	June	158
October	96	July	157
November	34	August	117
December	238	September	105
1927.		October	253
January	189	November	70
February	11		
March	2	Total	2,341

Although the total rainfall of each month appears to be fair, the highest individual fall recorded from the middle of June until the end of September was 36 points. Following these showers, very severe winds were experienced, which absolutely nullified any benefits that could have resulted from these small amounts. At this stage the general opinion was that the grain yield would exceed the seed used in planting by a small margin. However, toward the end of September and in early October 2 inches of rain fell, and the crops made a marvellous recovery, of which the yields per acre obtained are very good proof.

WHEAT VARIETY TRIALS.

The land selected was a fairly heavy clay loam, which prior to planting was ploughed in June, 1926, 4½ to 5 inches deep, springtoothed in September to the same depth, in October to a depth 2½ to 3 inches, and again in early January; harrowed in late January. The dry autumn did not necessitate a further cultivation until April, when the scarifier was employed, and in the case of the early maturers, the scarifier was used again in May. The strong, even germination that resulted was evidence of the excellent condition of the seed-bed after the use of the above implements.

Flag smut infection was very heavy throughout the early-sown plots, with the exception of Yandilla King, Wandilla, and Sands, these varieties being practically free. In the late-sown trials, which were adjoining the early-sown

and on land that had received exactly the same previous cropping, not a trace of the disease could be detected on any variety, thus proving that the spores germinated with the autumn rains and died for the want of a host.

Loose smut was present, but only in a very small degree, the infection not being heavy enough to influence the yield. A fair sprinkling of wheat blight (*Septoria*) was noticed in the young stages, due undoubtedly to the backward stage of the wheat.

All the trials were carried out in triplicate, each unit consisting of one-thirtieth of an acre. Harvesting operations were carried out on 7th December in the case of the early maturers, and 12th December with the late maturers.

Early-sown Grain Varieties.

The plots were sown on the 25th and 26th April at the rate of 67 lb. per acre with superphosphate at 70 lb. per acre. Duchess showed good growth throughout, but displayed a slight tendency to shatter. Having given an average yield of 1 bushel per acre over Yandilla King, it warrants further close investigation. Yandilla King and Union, our standard varieties for early and mid plantings, again proved their capacity to yield in a dry season as well as in the wet ones, as experienced of late years. Nizam made a good show with 32 bushels per acre; it has a short straw like Union, and will hold its grain well. Turvey also gave 32 bushels per acre, the final period of the growing season being ideal for this variety.

YIELDS of Early-sown Grain Wheats.

Variety in Order of Merit	Average acre yield, 1927	Average acre yield since 1926	Variety in Order of Merit.	Average acre yield 1927.	Average acre yield since 1926
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Duchess	36 20	28 35	Bena	29 40	23 55
Yandilla King ...	35 20	27 35	Ranee	29 40	25 5
Union	34 0	30 5	Bredbo	29 30	25 20
Nizam	32 0	...	Sands	28 0	...
Turvey	32 0	25 5	Currawa	27 48	23 4
Major	31 40	25 5	Federation	27 30	24 10
Gallipoli	31 20	26 20	Hard Federation ...	27 0	23 20
Onas	30 40	25 5	Wandilla	26 0	22 25
Quartzy	30 20	24 25			

Late-sown Grain Varieties.

Varieties in this section were sown on 24th May with 80 lb. seed and 85 lb. superphosphate. To assist in the preservation of the mulch the crop was harrowed on the 17th August.

The plots were harvested on 7th December, all varieties being in ideal stripping condition. Bobin, which gave the highest yield is an attractive, brown-headed wheat, and is classed as a wheat suited for dry areas. The yield of Baroota Wonder is a very creditable performance; it is a wheat more popular for hay purposes than grain production.

Nabawa, the variety that is commanding so much attention at the present time owing to flag smut resistance, showed a bad fault in its weakness of straw. This is the third year this variety has been tried at this farm, and the first occasion that any such fault has occurred. Individual straws broke down throughout the plots as though a severe gale had been experienced, whereas the weather at that time could be classed as quite normal. In spite of many heads being lost, the yield of 32 bus. 30 lb. is indicative of great drought-resistance. Merredin, the Western Australian introduction gained the same position in yield, also displaying good resistance to the dry season. Because of its yield of 32 bus. per acre, Gluyas Early must be given consideration in the future under similar conditions.

YIELDS of Late-sown Wheats for Grain.

Variety in Order of Merit	Average acre yield 1927.	Average acre yield since 1926.	Variety in Order of Merit.	Average acre yield 1927	Average acre yield since 1926.
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Bobin	35 20	28 40	Caliph ..	30 0	25 10
Baroota Wonder .	33 40	28 15	Canberra .	29 0	25 25
Nabawa . .	32 30	24 50	Boonoo	28 40	22 45
Merredin .	32 30	25 5	Duri	28 0	26 5
Gluyas Early ..	32 0	..	Gurkha .	27 20	26 5
Rajah .	30 40	23 50	Gresley .	25 20	21 0
Waratah	30 20	24 45			

Early-sown Hay Section.

All varieties were sown on the 22nd April with seed and superphosphate at 70 lb. per acre. Firbank, displaying the greatest drought-resistance, made excellent growth from the start, but the rains in September were too late to be of benefit to this variety, which had very nearly matured before the rain. As in the grain trials, the late-maturing varieties gave the best yield, being able to benefit by the long season. The varieties Kings Early, Firbank, Gresley, and Waratah were harvested on 24th October, and the remaining two on 7th November.

YIELDS of Late-sown Hay Wheats.

Variety in Order of Merit	Average acre yield, 1927				Average acre yield since 1926.			
	tons.	cwt.	qr.	lb.	tons.	cwt.	qr.	lb.
Yandilla King	2	7	1	8	2	0	1	2
Zealand	2	6	1	10	2	0	1	17
Waratah	2	0	1	22	1	17	1	23
Gresley	1	18	3	0	1	16	0	13
Firbank	1	15	2	24	1	11	3	4
Kings Early	1	14	0	24	1	10	3	14

OAT GRAIN VARIETY TRIALS.

This harvest completed the second cycle of the above trial, and as was the case last year, some excellent yields were obtained. The experiment was sown in triplicate, each plot consisting of one-thirtieth of an acre. Algerian was used as the standard in the late-maturers, and Mulga in the early ones.

The land was ploughed in June, 1926, 4½ to 5 inches deep, springtoothed in September to the same depth, and in October working 2½ to 3 inches deep. The springtooth was again used in early January, and the plots were harrowed late in January. The dry autumn did not necessitate a further cultivation until April, when the scarifier was used, and in the case of the early maturers the scarifier was again used prior to sowing in May. The resultant seed-bed was all that could be desired, and an excellent germination followed.

All varieties made good early growth, but were immediately checked by a prevalence of very severe frosts, which resulted in practically no further growth being made until the end of August; at this time Belar appeared to be showing the greatest resistance.

With the rains of the end of September and early October the crops made a marvellous recovery, especially the late maturers. The early maturers had advanced too far to derive any great benefit, and if anything the rain hastened maturity. All varieties were in ideal stripping condition, no lodging being experienced.

Late-maturing Varieties.

Planting was carried out on the 27th April, 60 lb. seed and 40 lb. superphosphate being used. Stripping took place on 22nd November. Algerian gave an excellent yield, 63 bus. 10 lb., the latter end of the growing period being ideal for the latest maturer.

YIELDS of Late-maturing Oat Varieties.

Variety in Order of Merit.	Average acre yield, 1927		Average acre yield since 1926	
	bus.	lb.	bus.	lb.
Algerian	63	10	53	10
Belar	60	13	48	32
Lachlan	48	20	48	10

Early-maturing Grain Oats.

These plots were sown on 24th May, the soil being in excellent condition, the seeding being at 65 lb. per acre, with superphosphate at 45 lb. per acre.

Harvesting was carried out on 17th November. Mulga did not show to its full advantage, as in previous years, due to the abnormal weather conditions experienced, the oats being very nearly ripe when the rain fell.

YIELDS of Early-maturing Grain Oats.

Variety in Order of Merit.	Average acre yield, 1927.		Average acre yield since 1926.	
	bus.	lb.	bus.	lb.
Myall	51	10	51	5
Gidgee	50	0	51	0
Palestine	49	30	45	35
Mulga	45	20	49	31
Buddah	45	0	45	0

Wagga Experiment Farm.

D. V. DUNLOP, H.D.A., Experimentalist

The past season was remarkable for a fairly dry autumn, with conditions unfavourable to the early growth of the plots. A glance at the rainfall reveals abnormally low falls for the first six months. The rain in October, however, saved the situation (coming as it did at the right time to fill the grain), and turned what would at the best have been very moderate yields into excellent ones.

Rain fell as follows between 1st April and 30th November:—

	Points.		Points.
April...	100	August	205
May	188	September	95
June	74	October	274
July	131	November	87
		Total	1,154

All plots were more free than usual from Cape and other weeds, the season being unfavourable to their germination and growth. Plots were sown during the period from the middle of April to end of May, and in most cases germinated before rain of any consequence fell, in spite of which a very good germination was obtained. The dry conditions during September caused most varieties to head out early, but the October rain enabled them to fill the grain.

Disease was not greatly in evidence, flag and loose smuts being the only ones at all prevalent. Both diseases were more noticable among the early-sown grain varieties, particularly Duchess, Onas, Bena, and Nulla. Nabawa, and Wandilla were not infected by flag smut.

Harvesting was carried out under ideal conditions, no heavy storms interfering with the work.

Preparation of Land.

The experiments were sown on red loam over a stiff subsoil of granitic origin, being typical wheat land of the district. A crop of Sudan grass had been grazed from October, 1925, to May, 1926. Ploughing was done with a mouldboard in June, 1926, and sheep were put on the fallow from time to time. The plots were skim ploughed in October, 1926, skim ploughed February, 1927, springtoothed April and harrowed April. An additional springtooth cultivation and harrowing was given during May for the late-sown trials.

Wheat Variety Trials.

Early-sown Grain Variety Trial.—Fifteen varieties were sown on 21st April, Hard Federation being used as a check. Seeding was at the rate of 49 lb. per acre, with superphosphate at 56 lb. A good germination was obtained, but the early growth was somewhat checked by the dry conditions. Baringa and Rajah stood out at this stage.

Wandilla, Baringa, Onas, and Rajah gave the highest yields, and looked well all through, although there was little to choose between the plots at any stage. Austan was the only new variety tried; it yielded fairly well, and is worthy of further trial. Wandilla, Baringa, Onas, and Rajah stand high in the average, and have always given fair yields. An average height of 3 feet 3 inches was attained by all plots, except Hard Federation and Union, which averaged 2 feet 9 inches. Baringa was particularly tough and difficult to thresh.

Flag smut was present in all plots except Wandilla and Rajah: Baringa was only slightly infected. Heaviest infection occurred among Union, Duchess, Onas, Austan, Bena, Nullah, and Ranee. Loose smut attacked Duchess, Rajah, and Union.

YIELDS of Early-sown Grain Wheat Varieties.

Variety in Order of Merit.	Average acre yield, 1927.	Average acre yield since 1924.	Variety in Order of Merit.	Average acre yield 1927.	Average acre yield since 1924.
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Wandilla	40 40	28 40	Duchess	35 30	29 20
Baringa	39 20	29 27	Bena	35 20	25 48
Rajah	38 26	27 2	Indian F. x Fed. ...	35 0	25 4
Onas	38 10	28 47	Dart's Imp. x Fed. ...	34 30	26 14
Union	36 40	28 21	Austan	34 10	1st year.
Nullah	35 50	26 17	Sands	33 20	23 58
Waratah	35 40	25 9	Hard Federation ...	28 30	23 48
Ranee	35 40	25 17			

Late-sown Grain Variety Trial.—In all, seventeen varieties were tried with Canberra as a check. Sowing took place on 18th May with seed at the rate of 60 lb. per acre and superphosphate at 56 lb. The seed-bed was fairly

dry, but a good germination was obtained. The low rainfall in June held these plots back considerably, but excellent growth was made from August on.

Nizam, Nabawa, Nullah, and Gallipoli 58, stooled very well, but did not grow quite as tall as the other varieties, averaging 3 feet while others grew from 3 feet 3 inches to 3 feet 6 inches.

Gallipoli, Nizam, Nulla, Duri, Nabawa, and Aussie stood out particularly well, and their averages are the highest. The range between the highest and lowest yield was not great considering the number of varieties. Two new varieties, Watchman and Three Seas, were not at all impressive, the latter being a bearded type. Nizam gives great promise; it yielded heavily, the grain being an excellent sample. It is rather later than the average. Clarendon x Hurst 14 and Federation x Cedar also showed promise, both yielding over 30 bushels, and were earlier than most of the varieties.

These plots made an even more marked improvement after the October rain than the early-sown plots, as they were not as far advanced.

They were practically disease-free, a trace only of flag and loose smut being noted.

YIELDS of Late-sown Grain Wheat Varieties.

Variety in Order of Merit	Average acre yield, 1927.	Average acre yield since 1924	Variety in Order of Merit	Average acre yield, 1927.	Average acre yield since 1924.
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Gallipoli 58	41 0	32 35	Binya	32 20	1st year.
Nizam	39 40	1st year.	Bandon	32 0	29 56
Nullah	38 0	30 46	Federation x Cedar ...	31 0	1st year.
Duri	37 10	32 50	Bald Early	30 40	1st year.
Nabawa	36 20	31 50	Baldry	30 20	27 3
Aussie	36 20	29 9	Sands	29 0	28 25
Bobin	34 10	28 10	Boolaroo	28 50	23 45
Clarendon x Hurst 14	34 0	1st year.	Watchman	28 0	1st year.
Canberra	33 50	27 54	Three Seas	23 0	1st year.

Hay Variety Trial.—Only early-sown trials of fairly early-maturing varieties are made, as it is desired to have all haymaking finished before grain harvesting in this district.

YIELDS of Early-sown Hay Wheat Varieties.

Variety in Order of Merit.	Average acre yield, 1927.	Average acre yield since 1924.
	tons. cwt. qr. lb.	tons. cwt. qr. lb.
Canimbla	3 13 0 14	3 3 3 18
Avoca	3 11 1 0	3 2 1 8
Waratah	3 9 1 14	2 5 2 12
Firbank	3 7 3 12	1st year.
Baroota Wonder ...	3 4 3 8	3 4 2 17
Wandilla	3 1 3 24	2 15 1 9
Gresley	2 14 1 4	1st year.

The plots were sown on 20th April at the rate of 49 lb. of seed per acre with superphosphate at 56 lb. per acre. Germination was good and fair growth was made in the early stages. All plots gained over 1 foot in height after the early October rains, averaging 4 feet in height.

All varieties yielded an excellent sample of hay, and, as reference to the results will show, there was little to choose between them. Firbank and Gresley are new to this trial; the former did very well, but Gresley is a little late, and was heavily infected with loose smut. Other plots were fairly free from disease.

Fallowing Experiment.

This experiment was designed to furnish a guide as to the best methods of working a fallow, as shown by the yields obtained. Seven plots were included, each half an acre in area; they were sown with Hard Federation seed on 22nd May at the rate of 58 lb. per acre, and superphosphate at the rate of 56 lb. per acre.

The methods of cultivation adopted was as follows :—

Plot 1 (*Ploughed July, Cultivated when necessary*).—This plot was mouldboard ploughed July, 1926, harrowed 4th October, skim ploughed 21st October, springtoothed March, 1927. Germination and growth were very good; disease was practically absent. Harvesting took place on 8th December.

Plot 2 (*Ploughed July, Cultivated February and after as required*).—Ploughing was carried out in July, 1926, and the plot was springtoothed in March, 1927. Germination was good, but subsequent growth only fair. Very patchy crop, and by far the worst of the plots. Harvested 8th December.

Plot 3 (*Ploughed July, Cultivated once in Spring and not again until February*).—Ploughed July, 1926, skim ploughed in October, and springtoothed in March, 1927. A very good plot; even and clean, not quite up to No. 1. Harvested 8th December.

YIELDS of Fallowing Experiment.

Plot No. and Treatment (in Order of Merit)	Average acre yield, 1927.		Average acre yield since 1925.	
	bus.	lb.	bus.	lb.
No. 5.—Cultivated as soon as possible after harvest, ploughed July, cultivated when necessary.	26	4	22	17
Nos. 1 and 7—Ploughed July, cultivated when necessary ...	24	59	21	52
No. 6.—Ploughed February—long fallow	24	44	20	51
No. 3.—Ploughed July, cultivated once in spring, and not again until February.	24	32	21	3
No. 4.—Ploughed after rain in New Year	21	6	17	23
No. 2.—Ploughed July, cultivated February and after as required	15	0	17	33

Plot 4 (*Ploughed after Rain in New Year*).—Plot was ploughed 12th May 1927, and harrowed 20th May. Made poor growth, and was very thin; improved after spring rains; was free from weed growth; trace of flag smut.

Plot 5 (*Cultivated as soon as possible after Harvest, ploughed July*).—This plot was skim ploughed March, 1926, ploughed July, harrowed October, skim ploughed October, springtoothed March, 1927. It proved the best plot of the series, being particularly free from weeds and disease, and very even and dense. This method of working the land appears to be the best from results obtained so far.

Plot 6 (*Ploughed February—Long Fallow*).—Plot was not ploughed until March, 1926, harrowed and skim ploughed in October, springtoothed in March, 1927. A good clean, even plot, not quite as good as No. 5.

Plot 7 (*Ploughed July, Cultivated when necessary*).—This plot was treated similarly to No. 1, and in growth it was similar also.

To Keep Seed True to Type.

Many growers contend that for farm seed a little mixing does not matter, as the yield is not affected. In the case of a mixed crop, however, the different varieties are often to be seen at various stages of maturity, and to be of different heights—two points which affect the harvesting of the crop. By a wider view of the case, a variety must be kept pure, because it has been developed on account of a desirable character that distinguishes it from other wheats. It may be suited to a particular soil, climate, or purpose; and mixing means deterioration in the seed sample in this very quality.

Care in the use of the harvester, grader, bags, and drills is necessary to keep a seed sample true to type.—J. E. Harrison, in the Victorian *Journal of Agriculture.*

How to Make Axle Grease.

There are two types of lubricating axle grease in use:—(1) Resin greases, which are essentially solutions of calcium resinate in resin oil; and (2) lubricating greases, which are essentially semi-solid or solid emulsions of fats, fatty oils, mineral oils, and resin oils with lime-soda or metallic soap.

Axle greases are usually of the first type, and are prepared by stirring dry slaked lime, freed from all gritty particles by careful sifting, into mineral oil until a homogenous mixture is obtained, and then adding resin oil containing "resin acids." The proportions of lime and mineral oil usually taken are five and ninety-five. This mixture forms the "stock." Into the stock a resin oil is run, and the mass carefully stirred and allowed to stand.

The following is a recipe for axle grease, using resin oil only:—

Slaked lime, 8 parts, slowly stirred into resin oil, 10 parts. Stir to incorporate thoroughly, and heat gently till of syrupy consistency. Heat 275 parts of resin oil with 1 part slaked lime and then allow to cool. The supernatant oil is removed from the precipitated matter and 5 or 6 parts of the foregoing resin oil-lime-soap are stirred in till all is a soft unctuous mass.

It is doubtful, however, whether the home manufacture of axle grease is likely to be an economic proposition.—A. A. Ramsay, Chief Chemist.

Fodder Conservation Competitions.

THE R.A.S. CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THREE agricultural societies organised district competitions this year, viz., Dubbo, Narrandera, and Wagga. It is not surprising that the competition did not attract a larger number of entries, for, in consequence of the very adverse conditions which prevailed throughout the greater part of the State during the past winter and spring, not only was it necessary to utilise large quantities of conserved fodder to maintain stock over the lean period, but, owing to the partial failure of crops in many districts, it was not possible to produce fodder to replenish the depleted stocks. While the dry conditions experienced last year may have interfered with the success of the fodder conservation competitions, still, they have been instrumental in demonstrating the great value of conserving fodder, and this is the aim of the competitions.

In my report on last year's competition reference was made to the thousands of tons of fodder which were allowed to waste. by neglect to convert into silage the prolific growth of self-sown wheat, wild oats and herbage in the spring and early summer of 1926 for the mere cost of harvesting and pitting. It has been aptly stated that "to waste feed is to want it," but little was it thought that a great need for this fodder would arise in the space of a few months. No doubt many stockowners regretted their neglect to conserve this fodder, but they might take the lesson taught by adversity, and resolve not to allow such an opportunity to pass again. Droughts would be robbed of their sting in this State if stockowners would conserve only half as much fodder as Canadian farmers are obliged to every year to tide their stock over the winter.

The conditions and scale of points for judging the competitions were slightly different from those used in the previous year, chiefly in that more credit was allowed for quality, and the competition was limited to fodder conserved for a period of up to four years. They were as follows:—

Fodders Eligible for Conservation to be—Concentrates (including all grains); roughage—as hay (*e.g.*, lucerne, oaten, wheaten, barley, clover, grass), straw or silage; and any other fodder suitable for conservation, produced on land, owned, leased, or held on shares by the competitor. Fodder conserved over a period of more than four years not to be eligible.

SCALE OF POINTS FOR JUDGING.

		Points.
1. *Suitability and Quality of Fodder*		60
(*a*) Judged according to the suitability of fodder, or combination of fodder, for the purpose for which they are required	25	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	

2. *Location and Protection*		45
(*a*) Locality—Location of the site, having regard to fire, flood, economy in feeding, and general access	10	
(*b*) Protection from weather, pests, stock, fire, and general deterioration	35	
3. *Economy of Production*		15
Including land value, production, storage and feeding costs.		
4. *Carrying Capacity*...		60
Quantity for the requirements of competitor's holding to be based on the sheep-carrying capacity of the holding (when improved and under natural pasture)—cattle and horses to count 1 to 6 sheep. The maximum amount considered to be competitor's requirements per sheep to be 5 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne = 1½ cwt. cereal hay = 3 cwt. silage = 4 cwt. straw = ½ cwt. grain).		
5. *Quantity of Fodder in excess of requirements*		20
At the rate of 10 points for surplus fodder equal to the quantity required for holding.		
Total		200

Judging was commenced at Dubbo on the 2nd May and was completed at Wagga on 4th May. The awards were as follows :—

Society.	Competitor.	Suitability and Quality of Fodder A	Suitability and Quality of Fodder B	Location and Protection. A	Location and Protection. B	Economy of Production.	Carrying Capacity.	Quantity of Fodder in Excess of Requirements	Total.
Wagga ...	A. Brunskill, Allonby, Wagga..	22	23	8	32	13	43	...	151
Dubbo ...	Cullen Bros., Bunglegumbie, Dubbo.	19	26	7	30	8	52	...	142
Narrandera ...	D. B. Millthorpe, "Somorset," Narrandera.	15	28	8	28	11	38	...	128

The success of Mr. Anthony Brunskill in again winning the championship for the third year in succession is most meritorious and stamps him as a pastmaster in the art of fodder conservation. Mr. Brunskill's property is 5,140 acres in area; 450 acres were cropped with cereals last year and 400 acres have been fallowed; 1,000 acres are under lucerne crops, and 160 acres have produced summer fodder crops—100 acres of Sudan grass and 60 acres a mixed crop of Japanese millet and rape.

The following is the fodder which has been conserved at "Allonby" for not more than four years :—

Kind of Fodder.	Year of Harvest.	Quantity.	Kind of Fodder.	Year of Harvest.	Quantity.
		Tons			Tons.
Silage, 2 pits	1924	450	Lucerne hay, 1 stack	1926	32
,, 2 ,, ...	1925	580	,, 3 stacks	1927	63
,, 1 ,, ...	1927	200	Trefoil and lucerne hay,		
Wheaten hay, 12 stacks	1927	717	2 stacks	1926	53
,, 1 ,,	1925	45	Oats, 176 bags	1927	9
Oaten hay, 6 ,,	1927	395			
,, 2 ,,	1928	33	Total	......	2,577

The outstanding feature was the excellent quality of this large fodder reserve, and while the whole was of high standard, special mention must be made of eleven stacks of wheaten hay and six stacks of oaten hay, the quality of which could not be improved upon; it was of remarkably good colour, and free from all weeds and undergrowth. There was no drought at "Allonby" last year, for all this cereal hay, together with another stack of wheaten hay, which was a little pale in colour, was the product of last harvest, the yield of oaten hay being 55 cwt. per acre, and that of wheaten hay 47 cwt. per acre. The fact that the cereal crops were all sown on land that was well fallowed is mainly responsible for the excellent hay yields, and also for the freedom of the hay from weed growth. The high quality of the hay was the result of sound judgment in harvesting the crop at the correct stage of growth, in expeditiously stacking the hay immediately it was cured, and in providing adequate protection from deterioration. The stacks were very well built on foundations of timber, the roofs well thatched, and drains were provided round the stacks to carry away any surface water. As a result of this effective protection against weather there is no waste even in spite of the heavy rains which have been experienced through the summer. Fences to protect the stacks from mice and stock had not been erected, as it is not the practice to go to the expense of providing this protection unless absolutely necessary, but the galvanised iron and other material were readily available should the emergency occur. The wheaten hay was of the Baroota Wonder variety, and the oaten hay Algerian, and the product was an indication of the value of these varieties for hay purposes.

The lucerne hay stacks were also well built on timber dunnage, the roofs well thatched, and the stacks fenced and netted to prevent damage by stock and pests. The lucerne hay was very leafy. Rather than risk the loss of leaf Mr. Brunskill prefers to stack the hay while still containing moisture, and thus produce brown hay, which is free from dust, and for which stock show a decided preference. Labour-saving machines, such as side delivery rake, waggon loader, and stacker, are employed to harvest and stack the hay with as little delay as possible, and thus reduce the risk of the hay being damaged by rain.

The silage was all conserved in pits, which are 18 feet wide, 7½ feet deep, and 75 to 90 feet long, with a batter at each end of one in three, and the sides sloping from the vertical to the extent of 6 inches. The silage was well protected with a covering of 2 to 3 feet of earth, which had been formed with a good "crown" to throw off rain water. Drains had been constructed on the hard ground at the sides of the pits at least a foot from the edge, in order to prevent any surface water from soaking into the pit. The silage was of good quality, and was all made from lucerne, being the first and last cuts of the season. Silage is usually the best form of conservation for these two cuts, as the first growth each year commonly contains much barley grass, and the cooler conditions with heavy dews are not satisfactory for curing hay from the last cut.

The grain was stored in a mouse-proof shed, which is also used for the storage of chaff; it was also fitted so as to provide shelter for sheep during shearing time in the event of rain.

The lucerne silage, in conjunction with the lucerne and cereal hay, provided a very satisfactory ration, and the amount of fodder conserved during four years was sufficient for the full feeding for over six months of the stock, equal to the carrying capacity of the property. This, however, does not comprise the whole of Mr. Brunskill's fodder reserves, for, in addition, there is over 1,000 tons of silage, which has been pitted for over four years, and was not therefore eligible for inclusion in the competition.

The second prize was won by Messrs. Cullen Brothers, of Bunglegumbie, Dubbo, whose property, situated on the Macquarie river, has an area of 1,070 acres, of which 300 acres produced cereal crops last season; 300 acres are fallowed, and 70 acres are now under lucerne crops; the balance of 400 acres was pasture, and the carrying capacity of the natural pasture was reckoned at 1½ sheep per acre. The conserved fodders consisted chiefly of lucerne hay, of which there was 280 tons; in addition, there was 20 tons of grass hay, 20 tons wheaten hay, 28 tons wheaten chaff, 12 tons wheaten straw, and 11 tons of wheat grain. This 370 tons of fodder was calculated to be sufficient for feeding for nearly eight months the total stock equal to the carrying capacity of the property if under natural pasture. Messrs. Cullen Brothers also had a number of hay stacks over four years old, which were not eligible for inclusion. The fodder varied in quality from fair to prime, and was well protected from damage, for all stacks were well thatched and built on a dunnage of pine timber, and were also fenced against stock. The grain and chaff were stored in a mouse-proof galvanised-iron shed, which had a concrete floor 4 inches thick, and a concrete skirting of 15 inches, into which the iron walls were let 6 inches.

Mr. Milthorpe's holding, "Somerset," at Narrandera, has a total acreage of 1,330 acres, which includes an annual lease of 554 acres, and the carrying capacity of the whole property is estimated at 1,050 sheep. Last season 40 acres were cropped with oats, and during the summer 27 acres of Sudan grass and 30 acres of sorghum have been grown; the remainder of the property is natural pasture. The reserve of fodders comprised 55 tons of oaten hay, 29 tons Sudan grass hay, 20 tons oaten straw, and 3 tons oats grain, all saved in 1926; also 300 tons of sorghum silage from a crop grown this season, the pitting of which had been somewhat protracted—extending over about a month—and the covering of which had not been completed. It was not possible, therefore, to assess what would be the ultimate success of the silage. The pit has been excavated some distance away from the sorghum crop, and the cost of pitting has been increased by reason of the long haulage of the fodder. The hay was well made, but with the exception of fencing the stacks from stock, there was no provision for adequate protection. The stacks were not thatched or built on dunnage, and although they were located

on a stony slope it was considered that there would be damaged hay at both the tops and bottoms of the stacks. There was also traces of mice infestation in the stacks of oaten hay. As the fodders consisted chiefly of roughage, and were deficient in protein, they could not supply a balanced ration. Lucerne hay would greatly improve the combination of fodders, and Mr. Milthorpe is giving consideration to the sowing of an area of his property with lucerne.

In this competition Mr. Brunskill has set an excellent example well worthy of emulation by stockowners throughout the State, for there is no reason why equal success cannot be achieved on a smaller scale by farmers in most parts of the State if similar methods are practised to those which have been here briefly outlined.

Silage forms an excellent basis of conserved fodders for feeding sheep in drought periods—not only does it provide a succulent, laxative feed which approximates very closely to natural pasture, but it can be conserved more cheaply and safely than other fodders. Moreover, ensilage allows of the conserving of fodder where conditions or the material are not suitable for hay-making. During the spring of 1926 several farmers in the west took advantage of the prolific growth of self-sown cereals and herbage and conserved it as silage. It was their first experience with silage, and it is reported that in some instances the result of the feeding of the silage was disappointing—that the sheep did not readily eat it, and much of the silage fed out to the sheep was therefore wasted. Evidently this was due to inexperience in feeding silage, for it is a fact that in commencing to feed silage to stock they frequently do not readily take to it, and apparently require to acquire a taste for it. Similarly, sheep will at first refuse to eat green crops such as rape, to which they are not accustomed. In starting to feed silage, only a small quantity should be fed to the sheep in a small paddock, and it is preferable to feed it out in the evening, for if large quantities of silage are put out in the morning and the sheep do not at once take to it, it will dry out in the hot sun within a few hours, when it will be wasted by the sheep. It is also desirable that a supply of salt should be made available to the sheep when the silage is being fed. Once the sheep become accustomed to feeding on silage they will greatly relish it, and will follow the wagons when the silage is carted out to the paddock.

The scale of points adopted in judging this year's competition proved very satisfactory, and provided an equitable basis for competition by both large and small property-owners.

Unless the farm is managed as a business, the yield of every cow recorded, the low producers eliminated, and only the big yielders and their progeny kept, the natural advantages of good fertile land, large rainfall, and magnificent fresh-water streams cannot be put to maximum use.

Fallowing Competitions, 1927-28.

Some of the Judges' Reports.

THE DUBBO COMPETITION.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

WHILE the whole idea of these competitions is educational. and it is hoped that the individual may profit from his contact with the judge, it is found that entrants are mostly those who have entered in previous competitions. This points to one of two things, either these farmers have benefited from their previous entry and are out to improve their methods still further, or they are imbued with a sense of duty which impels them to support their association's efforts But each year brings to light a few newcomers, who nearly all state they have entered to try and learn. and it is to be hoped their enterprise will be rewarded.

Farming to-day is a science and a profession, and it is only those who are prepared to make a study of the soil and its requirements who will make a success of wheat-growing over a period of years. No rule of thumb methods will succeed, as soil and seasonal conditions suitable to the development of wheat diseases and weeds are constantly varying. Better farming practices embrace certain principles, which, with modifications to suit local conditions, may be generally adopted; but it is the farmer who is observant of the object lessons constantly to be seen on his own property and who profits by them—who will experiment for himself on the lines suggested—who will succeed where others who are not so observant will fail. The writer has learned much from his recent visit as judge to the seventeen fallows entered by the fourteen competitors, which, it is hoped, will be of considerable benefit to himself and those he comes in contact with in the future.

Close observation of varying types of soil have given, it is thought, a definite insight into the best methods of working to be adopted. It would appear that certain soils, namely, red sandy to medium loams such as are found at Rawsonville, Balladoran, and parts of Geurie district, can be brought to too fine a condition on the surface by frequent workings with such implements as the harrows and disc cultivators, with a consequent detrimental effect on the subsequent crop. It should be the constant endeavour of owners of this type of soil to keep a mulch which is as cloddy and ridged as possible by the use of tine implements, to prevent undue erosion and setting of the

surface soil. While it is very important to pay strict attention to the question of consolidation of the sub-surface soil, or that area below the loose mulch down to the depth of the original ploughing, a mulch (of loose, dry earth and clods of varying sizes and of uniform depth—which should not be deeper than 2½ inches) must be aimed at. It should be remembered that soils will dry out, particularly during the summer months, to the full depth of the cultivation until remoistened by further rains, and it is this air-dried, loose surface which prevents loss of moisture by evaporation from the reserves stored in the soil and subsoil by early ploughing and the subsequent workings.

On the other hand, certain types of soil which are to be found in the Eumungerie, Coboco, and parts of the Geurie district, are partially self-mulching, and the main trouble is to hold the moisture close enough to the surface to give uniform and satisfactory germination. It is practically impossible to spoil the condition of these soils; it would appear that the finer the state of tilth they can be brought to the shallower will be the mulch overlying a moist area close to the surface, which will be more likely to have conditions of soil temperature and moisture suitable for good germination results than a moist and compact area located at a greater depth.

The Season.

The season was notable for the frequency and heaviness of its summer rains. During 1927 this part of the west experienced one of the driest winters on record. From early May till late September barely 2 inches of rain were recorded at all centres, consequently winter feed was scarce, the land was hard, and very little fallowing was done when most advisable during the early winter months. Much seed sown last year failed to germinate satisfactorily, and the crops that did grow were fed off. The land was worked up to form what might be considered an enforced long summer fallow, and in some cases a two-year fallow. Several of the fallows inspected come under this category. Good rains in late September and early October enabled this land to be worked up, and winter ploughed land to be cultivated. Heavy rain at frequent intervals during November, December, January, and February, totalling 16 inches, necessitated frequent workings to remove hardened and crusted surfaces and to keep weed growth in check. While these rains were abnormal and necessitated constant work to keep fallows in order (many have been neglected and to-day are a mass of summer weeds), the additional workings involved will benefit the subsequent crops. What is not fully understood by many is that increased fertility is produced by each additional working, or, in other words, that the activity of soil bacteria is increased, resulting in an increased amount of plant-food dissolved in soil moisture being made available for plant use.

The following are the rainfall records for the fallow period at a number of centres :—

	Rawsonville. (H. Harvey).	Horseshoe Vale. (R. A. Harricks).	Eumungerie. (W. Richards)	Kelvingrove. (E. C Richards.	Claydon (C. Lowe).	Dubbo (Official).
	points.	points.	points.	points.	points.	points.
From start of fallow to June, 1927	...	...	..	234	1,149	...
July, "	...	47	58	45	51	8
Aug., "	...	64	130	163	77	108
Sept., "	...	302	150	110	185	117
Oct., "	93	132	65	80	90	167
Nov., "	529	557	460	411	507	605
Dec., "	147	141	88	95	151	105
Jan., 1928	283	341	350	408	326	284
Feb., "	637	595	467	400	617	630
Total ...	1,689	2,179	1,768	1,944	3,153	2,024

The Leading Fallows.

The winning fallow was produced by Cullen Bros., "Bunglegumbie," on box and pine country—a medium red sandy loam. It was under crop in 1926 and was disc ploughed 4 inches in July, 1927, harrowed September, springtoothed October to full ploughing depth, shallow springtoothed December, January, early and late February, a total of six workings, not including the ploughing. Sheep were also used when necessary.

The result was nearly perfect. Moisture was abundant, as was to be expected after the heavy summer rains. provided they had been held, but it was well down in the subsoil; the mulch consisted of an even, cloddy layer 2 inches deep; consolidation was good and weeds were totally absent. There were no finishes to be seen and headlands were small and well attended to.

Mr. H. J. Harvey. of "Kindalin," who is a constant performer in the preparation of good fallows with a thorough understanding of what is required, was a close runner up with a well prepared fallow on level, medium red loam, typical of box and pine country. It was not ploughed with a disc until early October owing to scarcity of feed, but was springtoothed on seven subsequent occasions when warranted. The result was a high-class fallow practically weed free, not too fine on the surface, with an even 2-inch mulch and just about an optimum of moisture.

Mr. R. A. Harricks, of "Horseshoe Vale," who tied with Mr. C. A. Wright, of "Dulla Dulla," for third place, deserves special mention for his effort, as wheat farming is new to him. This fallow is on soil extremely difficult to work evenly on account of its many variations in texture, colour, and appearance. It varies from light sandy to black crumbly clay loam. Ploughed during June–July, it was worked ten times with harrows, springtooth and rigid-tine implements, and when judged conformed pretty nearly to all the requirements of an ideal seed-bed.

Mr. Wright's fallow on river country had been worked six times, and was in excellent order.

Every fallow seen was full of merit; with few exceptions farmers have got a grip of the principles underlying the preparation of an ideal seed-bed. While it must be admitted that nature aided them largely this year by natural consolidation of the soil and enforced workings if weeds were to be kept in check, still the fact that the farmer cultivated his ground when necessary shows that he is mainly conversant with what is required. In one or two instances deep cultivations were given after the last rains. This is undoubtedly a mistake, as much moisture which could have been held was allowed to escape and consolidation of the subsurface soil was largely spoiled.

AWARDS in Dubbo Fallowing Competition, 1928.

	Competitor.	No. of workings given excluding ploughing.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition of headlands and finishes.	Total.
1	Cullen Bros., Bunglegumbie	6	33	32	35	32	9	141
2	H. J. Harvey, Rawsonville	7	32	33	34	32	9	140
3	R. A. Harricks, Horseshoe Vale	10	32	33	33	32	8	139
3	C. A. Wright, Dulla Dulla	6	33	32	34	31	9	139
5	W. Wheaton, Balladoran	5	33	31	32	33	9	138
5	R. A. Harricks, Horseshoe Vale	10	32	33	32	33	8	138
7	W. P. Nugent, Terramungamine	6	33	32	32	32	8	137
8	W. Richards, Eumungerie	3	33	32	30	33	8	136
9	Whitely and Stewart, Geurie	3	32	30	33	32	8	135
9	C. J. McLeod, Windora	8	32	31	32	33	7	135
9	E. C. Richards, Eumungerie	6	33	31	31	32	8	135
12	James and John Whitely, Geurie	3	32	30	31	32	9	134
12	W. P. Nugent, Terramungamine	7	32	31	31	32	8	134
14	C. Lowe, Coboco	7	34	30	30	31	8	133
15	W. Richards, Eumungerie	5	30	31	31	32	8	132
16	J. L. McCallum, Terramungamine	4	31	29	32	30	9	131
17	J. J. O'Connor, Obley road	5-6	30	29	32	31	8	130

WEST WYALONG COMPETITION.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

Seventeen entries were received this season, but four were withdrawn on account of flood damage. All the entries were of a high standard; even those at the bottom of the list were good, while those gaining honours were of quite outstanding merit. Great improvement has been gradually taking place in the fallowing methods adopted in the district, and at the present time practically every competitor knows exactly what to strive for, knows perfectly just what condition his finished fallow should be in to give the maximum crop. The result of this knowledge was reflected in the excellent condition of the fallows.

The methods adopted to bring about this ideal final condition of the fallows varied of course to suit the class of soil. Some soils stand more working than others, and each class of soil must be worked differently to secure the best results. It is in this connection that Mr. Staniforth's win is so full of merit; he is situated on red loam, which is somewhat more difficult to get into ideal condition than the black self-mulching soil, which responds so much better to harrowing.

All the fallows in the competition had been grazed heavily with sheep and were very clean, considering the heavy rains that have fallen since January. The rainfall on some of the fallows was as follows:—

	Inches.		Inches.
H. W. Staniforth	18	H. S. Marshman	17
S. R. Marshman	17	C. Ford	19
C. J. Thomas	11	S. Ford	21
F. G Hebblewhite	20	D. Bolte	19

The Winning Entries.

Mr. Staniforth's winning fallow had been mouldboard ploughed in May to a depth of 4 inches, springtoothed June, using fine points to the full depth, springtoothed four times to a depth of 1½ to 2 inches. The result was an exceptionally good fallow. Every working had been carefully carried out and the springtooth cultivator points were kept constantly adjusted so that they all worked at the correct depth. The result was that the top of the seed-bed was perfectly uniform. After the surface mulch (consisting of 1½ to 2 inches of loose clods of reasonable size) was shovelled off the seed-bed was seen to be as even and level as it is possible to obtain it. The consolidation was very satisfactory—no buried clods or air spaces were found on any part of the fallow—and the whole was exceptionally even. The fallow had been heavily grazed with sheep of course and was free from weeds. On such a fallow germination and early growth of the subsequent crop must necessarily be most satisfactory.

The keenness of the competition is shown by the fact that it was difficult to separate the three leading fallows. A difference of half a point is very small, out of a possible 150 points. Mr. H. S. Marshman gained second place with an excellent fallow on heavy blackish-grey, self-mulching soil, originally carrying belar, box, and yarran; this class of country is best worked while it is dry; it is almost impossible to work it while wet. This fallow had been scarified with a rigid-tine scarifier to a depth of 2 inches in March, again 3½ inches deep in July, harrowed in August, springtoothed 2 inches deep in November, and again in January, scarified 2 inches in March and then harrowed; in all, seven workings. The result was a fallow very satisfactory in every respect, which showed the value of exceptionally careful and intelligent working.

Mr. F. G. Hebblewhite gained third place with a 2-year fallow on strong, self-mulching red clay loam; originally this country carried whipstick mallee. It had been springtoothed in January, 1926, and stocked heavily with sheep

until February, 1927, when it was scarified 2 inches deep, scarified again 3 inches deep in May, harrowed in July, scarified 3 inches in October, harrowed in October and again in November, springtoothed 2 inches deep in January, harrowed in February, scarified in February, harrowed in February and again in March. This fallow also was exceptionally good; it was quite free from weeds and had been worked carefully in lands each time. It was one of the neatest and cleanest fallows I have ever seen and scored the maximum for cleanliness and condition; had it been more even in the consolidation and the mulch a little shallower, it would have scored the maximum under every heading.

Comment.

The soils vary considerably in the West Wyalong district, and the best advice that can be given is to follow the methods of working the fallow adopted by the most successful men on similar country. As an example—farmers on medium textured to light red loam will be on the right lines if they adopt methods similar to those of Mr. Staniforth. Those on heavy blackish self-mulching clay loams can safely follow similar methods to Mr. H. S. Marshman. Those on the intermediate classes of soil of course have to modify the methods to suit their particular country.

It is pleasing to observe that in this district there is developing, to a certain extent, a standardisation of fallowing methods for each class of soil, and this view is supported by the fact that each competitor's fallow visited was found to have been worked in the special manner most calculated to give somewhere near the best results for that particular class of country. No doubt we still have a long way to go in this direction, but that some considerable advance has already been made, is most apparent.

AWARDS in West Wyalong Fallowing Competition.

Competitor.	Moisture	Mulch.	Cleanliness.	Compactness.	Condition of headlands and finishes.	Total.
W H Staniforth, "Buddigower," West Wyalong.	33	34	33	33½	9	142½
H. S Marshman, "Pinehurst," Wyalong	33	32	35	33	9	142
F. G. Hebblewhite, "Fairfield," Wyalong.	33	32	35	31½	10	141½
S. Ford, "Brentwood," Wyalong ...	34	31	33	33	9	140
D. Bolte, "Lincluden," West Wyalong	32	32	32	33	9	138
H. V. Davies, "Hillview," Caleen ...	34	30	32	32	9	137
C. Ford, "Brentwood," Wyalong ...	34	30	32	32	9	137
S. R. Marshman, "Marshlands," West Wyalong.	32	33	32	31	9	137
H. McFadyen, "Lochbine," West Wyalong.	33	31	28	34	9	[illegible]
C. Porter, "Clairinch," West Wyalong	33	30	32	30	9	[illegible]
F Hoare, "Ormarula," Wyalong ...	32	31	30	31	8	[illegible]
J. R. Scealy, "April Hill," W. Wyalong	32	28	30	28	8	[illegible]
C. J. Thomas, "Windera," W. Wyalong	34	26	27	28	9	12

LOCKHART COMPETITION.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

This year the Lockhart P.A.&.H. Association departed from its usual method of conducting a farm and crop competition, and launched out in its first combined fallow and crop competition—the fallow section of which has been judged. There were sixteen entries, representing a large range of country and embracing a variety of soils. Taking into consideration the very wet autumn and the difficulty of working the fallows, together with the prolific weed growth and the fact that it was the first competition, the number of entries was very creditable. This is the first time the fallows of the district have been inspected at length, and I was favourably impressed; as the awards show, the leading fallows compare with those in other districts. The leading fallows showed that, despite the seasonal conditions, it was possible by judicious working to hold the condition in the fallow, and keep down the weeds. They also emphasised one important point—the value of the scarifier, the rigid-tine duckfoot implement.

The rainfall during the fallow period was:—July, 1927, 157 points; August, 168; September, 90; October, 359; November, 25; December, 13; January, 1928, 243; February, 412; March (up to 24th), 244 points.

It has been proved that our soils respond to deep cultivation early in the winter, ploughing, say in June; this to be followed by a harrowing to break down the comb, and then about the end of September or early October, a deep rooting through to the ploughing depth with the springtooth. From then on all summer cultivation should be shallow and the mulch left ridgy. These ridges will prevent the mulch running together in wet weather. It is becoming more evident each year that the best implement with which to do this work is the scarifier. This implement also assists consolidation. cuts out the weeds in a most efficient manner, and makes an even depth of mulch. The scarifier is not used much in this district; it is doing excellent work in other districts and where used in this district.

Most of the fallows were worked with the springtooth throughout. This implement gives good results with careful handling, but requires to be used frequently and with shallow workings (keeping on crossing the workings) if a level seed-bed is to be obtained. This was the method employed by the winner of the competition, but equally as good fallows have been seen which had been produced with much less working by the use of the scarifier.

The majority of the fallows had the same fault—a rather wavy seed-bed. This was often caused by too deep working with the combine, the back tines dragging and cutting into the seed-bed, making ridges underneath the mulch. Combines are meant to give the surface a light working before, or at the time of sowing, but are put to heavy work on the fallows early in the season, which probably strains the implement, especially as the front tines have to take

a good deal of strain with heavy working. This may have a lot to do with making the back tines drag and cut deep. A good, strong springtooth or preferably a scarifier, should be used for the heavy work.

Summer fallowing should be especially profitable in this district. Each of the three placed fallows were summer fallowed, and they were hard to fault.

The winning fallow, entered by Mr. J. Gollasch, was good red loam, pine and box country which had been cropped for thirty-two years. It was summer fallowed—disced in February, mouldboard ploughed July and early August, springtoothed deep in October, and shallow in November, January, twice in February, and again March. This fallow was worked six times with the springtooth cultivator after ploughing.

Mr. P. Rees, who gained second place, entered a fallow on heavy clay soil, box country, which had been cropped for eighteen years.

It was summer fallowed—scarified early March, mouldboard ploughed in early July, harrowed in September, and scarified in October, February, and March.

AWARDS in Lockhart Fallowing Competition.

Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition of headlands and finishes, &c.	Total.
J. Gollasch	35	33	33	34	9½	144½
P. Rees	35	33	33	33	9½	143½
Kennedy Bros.	35	32	33	33	9½	142½
Tutty Bros.	35	33	33	32	9½	142½
W. Gollasch	35	32	32	33	9	141
T. C. McDonnell ...	35	32	34	31	9	141
P. Gooden	35	33	32	32	9	141
E. T. Kendell	35	33	31	31	9½	139½
S. R. Jarvis & Son ...	35	32	32	31	8½	138½
A. Eaton	35	33	30	30	9	137
J. A. Ralston	35	32	30	31	8½	136½
Hogan Bros.	35	32	28	32	8½	135½
J. W. Gooden (Entry No. 1)	35	30	32	28	9	134
J. W. Gooden (Entry No. 2)	34	28	31	29	9	131
D. J. McLellan	35	30	28	28	8½	129½
H. King	35	28	30	25	8	126

Messrs. Kennedy Bros.' entry was heavy red clay loam, box country, which had been cropped for thirty years. It was summer fallowed—disced early April, mouldboard ploughed June, and scarified end August, harrowed September, and scarified October, January, February, and March. This fallow also had six workings after ploughing.

FEEDING forms the basis of any improvement in dairy herd production. Systematic testing is the gauge which shows how each cow uses the food given her; some waste it, others turn it into beef, but the good dairy cow puts it into the bucket in the form of milk.

Field Experiments With Potatoes.

Grafton Experiment Farm, 1927.

R. J. DAVIDSON, Experimentalist.

A trial of potato varieties was conducted at this Farm during the past season. The early part of the season was very dry, but rain on 7th June gave the fallow a good soaking. From then until the latter end of September only scattered showers, which were too light to be of any value, were received, and during July and August frosty nights and fine, windy days prevailed. After the dry spell broke on 25th September, the rainfall was sufficient for requirements. The monthly totals were as follows:—May, nil; June, 171 points; July, 42 points; August, 40 points; September, 376 points; October, 357 points; November, 398 points. The total on the growing crop was 1,170 points.

Cultural Notes.

The trial was located on black alluvial soil, somewhat uneven in character, containing a few clayey patches, and which cannot be regarded as first-class potato land. In the previous spring it was planted with cotton, which failed. The site was disc ploughed on 19th January, 1927, disc harrowed on 11th and 25th February, springtoothed on 18th March and 17th June, reploughed on 14th July, harrowed, disc harrowed and lightly rolled on 28th July.

Each plot was one-tenth of an acre in area. Factor was used as a check and planted in every alternate plot. The seed of Factor and Manhattan was of excellent quality, being sound and well shot. That of Satisfaction and Early Manistee was not quite so good; the tubers were not so well shot, and in the case of the latter about 5 per cent. were unsound. The sets (mostly cut) were ploughed in on 3rd August 5 inches deep, 16 inches apart, in every third furrow (the rows being 33 inches apart). Rate of seeding was 10¼ cwt. per acre. The soil was dry, but otherwise in excellent order. It was lightly rolled after planting to assist capillarity, and harrowed.

Germination was slow and irregular owing to the dry, cold weather. Eventually a fairly good stand was obtained, with the Manhattan and Manistee plots showing a few more misses than the others. Subsequent growth was good, the September rain being of great benefit to the growing crop.

All plots were inter-row-cultivated and hilled on 6th October, and cultivated on 19th October. Weed growth was not troublesome. The larvae of 28-spotted ladybird appeared in considerable numbers about mid-November, but the crop was so far advanced that the damage was practically confined to the foliage.

Harvesting was carried out from 1st to 3rd February with the following results:—

	Yield per acre based on percentage. t.	c.	lb.	Percentage of small tubers.
Satisfaction	7	10	30	3·6
Factor (average of checks)	7	9	92	4·2
Early Manhattan	6	18	22	2·5
Early Manistee	4	18	99	4·6

Remarks.

Harvesting was delayed owing to the wet weather during January. Continued showery weather and water lying in the depressions after the crop matured resulted in some of the tubers rotting; hence yields were lower than would have been the case had harvesting been carried out at the correct time. However, the irregularities ran across the plots, and all plots were on the same basis.

Factor again demonstrated its suitability for local conditions, the computed yield being only 50 lb. less per acre than Satisfaction. Both gave a very high percentage of marketable tubers of attractive shape. Manhattan produced approximately 11½ cwt. less per acre; the potatoes were excellent in shape and appearance. Early Manistee matured a few days before the others, but its yield was low, being only two-thirds that of Factor. This variety does not appear to have much to recommend it for growing locally on a commercial basis. The other three varieties are safe and reliable yielders for this district.

The Effect of Top-dressing on Wool.

Though there can be no question as to the added feeding value of top-dressed pastures, there is a good deal of uncertainty as to the effect on the wool fibre of a sheep that is run continually on pastures which have been treated to an application of superphosphate. It has been decided to inaugurate trials in different districts, and four of these will shortly be in progress.

The idea is to select an even lot of sheep, wethers for preference, as they are less liable to change from year to year, and divide them into lots—one lot to be run on top-dressed pasture, and the other lot to be left on natural pasture. In three instances sufficient manure is being supplied to landowners to top-dress 40 acres of land each. The trials will actually be started shortly, but one trial has been in progress since November, the wethers being shorn and samples of their wool being taken before they were put into their respective paddocks.

The plan of the trials provides that certain individual sheep will be marked in each lot, and at shearing time samples of their wool will be specially taken and kept for twelve months, when wool from the same spot will be taken for comparative purposes. Results up to the first shearing in the spring will be kept for the three trials about to be commenced, but it is expected that more definite data will be obtainable over the following twelve months, when the manure will have had more chance of becoming effective.—E. A. Elliott Sheep and Wool Expert.

The Establishment of Tubercle-free Milk Zones.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.*

So far as I am aware, no lecture with the above title has ever previously been given in this State, and so we are, to a certain extent, breaking new ground. Such being the case, it appears necessary to take up the question from its very foundation, and to carry our discussion through to the actual point of the establishment of tubercle-free milk zones. The basic reason why this question is under consideration at all lies in the fact that there exists in cattle a certain disease—tuberculosis—which is also found in pigs, horses, fowls, man, and other animals. Several strains of this disease exist, known according to the animal in which each one is most commonly found. Thus we have the human strain found chiefly in man, the bovine strain found chiefly in cattle, but also in pigs, horses, and man, and the avian strain found chiefly in birds but also in pigs.

Now, it is just that fact that the bovine strain is found in man, which has brought us here to-night to discuss the question of the establishment of tubercle-free milk zones. The fact that the bovine strain is found in man indicates that, in some way or other, tubercle bacilli from cattle have gained entrance into the human body. From the type of case in man in which the bovine bacilli are found, it is evident that they are introduced into the body with the food. The only food likely to contain bovine tubercle bacilli is cows' milk, beef, and pork. Of the three, milk is most likely to be dangerous, and this is supported by the fact that the amount of tuberculosis caused by the bovine strain is much greater comparatively in young children than in adults. The milk of a cow whose udder has become tuberculous is a most dangerous product, but the flesh of a tuberculous animal, unless grossly infected, or infected in such a way as to indicate spread by the blood stream, is not likely to be dangerous.

The Importance of Tubercle-free Milk to Children.

In all our work against tuberculosis in cattle from the human health standpoint, it is in regard to children that most concern is felt, and in order to show that this question is an important one from the children's viewpoint it is proposed to quote a few examples of the results obtained in various countries.

In the eighth annual report of the Glen Lomond Sanatorium, in Scotland, the following statement is made :—

> In an investigation into the type of tubercle bacilli found in the tracheo-bronchial glands in children which have died from any cause, in over 50 per cent. of the cases the bacilli have so far been found to be bovine. (Thomson and Ford, *B.M.J.*, 4–6–27.)

* Lecture delivered before the Municipal Council and public of Mittagong.

Penfold, reporting on a series of cases investigated in Melbourne, concluded his report by saying :—

The chief fact to be learned from this table is that no less than 26 per cent. of the infections of the first four years of life are bovine in origin, and though the numbers are small they clearly demonstrate that bovine tuberculosis is a definite menace to Melbourne children.—(*Med. Jr., Aus.*, 3-5-24).

Gustaf Rejner, reporting on the question in Sweden, said :—

It must, therefore, be of importance to have the non-tuberculous herds searched for, and as far as possible taken advantage of for the production of milk, which, granting it fills other hygienic requirements, can bear the important characterisation of children's milk. The non-tuberculous stream of milk must be widened and deepened to benefit more and more children.

Sir Henry Gauvain, in his work amongst tuberculous children, found that 54 per cent. of cases of tuberculosis of the spine in children under fifteen were of bovine origin.

Griffith, who has done an enormous amount of work on this question in England, reports the following figures :—

Age.	No. of Cases.	Per cent. Bovine.
0–5 years	221	37·55
5–10 ,,	312	29·45
10–16 ,,	119	14·66
16 upwards	342	6·25

Amongst his cases reported were twelve of tuberculous meningitis, two of which were of bovine origin, and he adds the following note :—" The cows' milk supplied to one of the bovine cases was examined and found to contain tubercle bacilli identical in cultural characters with the strain from the meninges of the child." (*Jr. Path. Bact.*, xxvii, 1920).

Gair reports two cases of tuberculosis in children, and adds the following note :—

In one the milk supply for the child was obtained from cows which were tested half-yearly, and were always in excellent health. . . Milk was then obtained from a neighbour's cow for ten days, and this cow was found to be eliminating tubercle bacilli in the milk. Three months later the child became ill, and was found to be suffering from tuberculosis of bovine origin.

From these reports you would gather, and rightly, that tuberculous milk is a distinct danger, particularly to children. One's first inclination on seeing such figures is to become rather panicky; but panic and exaggeration will never bring about satisfactory results. We are in this country in the fortunate position that tuberculosis is by no means so rife amongst our cattle as is the case with long-settled countries, in which the cattle are kept confined on small areas, and in buildings during almost their whole lives. Nevertheless, the disease exists to quite an appreciable extent.

The officers of the Departments concerned in dealing with the question are now bringing about the destruction of about 2,000 animals a year on account of this disease. That does not account for nearly all those actually destroyed on account of it, nor of those found diseased after they are killed at the abattoirs and condemned.

Unfortunately, there is a tendency at intervals to create panics in this matter, and then wild demands which are incapable of being carried out. In between these panics the whole question is allowed to lie dormant. To us, however, who are actually engaged in the work of disease control, neither the panic period nor the dormant period are any use. What we have to do is to lay far-sighted plans of a steadily progressive nature, and to work along them as fast as circumstances will allow. During the last two years we made a big step forward with regard to tuberculosis, for provision was made for the establishment of what are known as accredited tubercle-free herds. When this plan, which is in operation by virtue of an understanding between all the States of the Commonwealth, was first proposed, there were not wanting those who said that no one would ever consider it. We who had faith, however, arranged that the scheme should be confined to pure bred herds or herds actually supplying milk for sale. It was as well we did so, as otherwise, in a year or two, we would have been unable to fulfil our obligations. As it was, we had some difficulty in getting through this year. However, more officers are being appointed to the branch, and we shall be able to do more work, but we dare not remove the limitations or we could not do the work. It is necessary to move gradually and steadily ahead.

Mittagong district has the honour of initiating the next two forward movements, for the Berrima District Hospital demands that its milk supply shall be from a herd to which the test has been applied, and the Municipality of Mittagong is initiating a discussion of the possibility of establishing tubercle-free milk zones.

Economic Arguments for Freedom from Tubercle Bacilli.

Before, however, we deal in detail with the latter question, we should first consider the economic side of the matter and the action being taken in other countries.

It would appear that on the one ground of the preservation of human health it is desirable that we should possess a tubercle-free milk supply. But the question goes further than this. If the milk supply is tuberculous, heavy economic loss will result as well. Every year quite a considerable number of pig carcases are condemned at abattoirs as unfit for human consumption because of tuberculosis. In the majority of these cases the disease has been contracted, either directly or indirectly, through tuberculous milk or tuberculous meat. Young calves are also found to be tuberculous, and the disease in these calves indicates that it has been contracted through the food—in that case, almost certainly through tuberculous milk. Again, the mere fact that cows are tuberculous reduces their economic value and renders them liable to other disorders to a greater extent than is the case with a healthy animal. Many actually die from tuberculosis. It is therefore evident that a tubercle-free milk supply, meaning as it does tubercle-free cattle, has importance from both health and economic aspects. Both aspects of the case have been recognised elsewhere.

What Some Parts of the World are Doing.

It is perhaps natural that islands should take a special interest in the matter, because it is so easy to isolate them. Thus we find that the island of Guernsey set itself out to eradicate tuberculosis in cattle, and, in doing so, it was found that there was a coinciding decrease in tuberculosis in man. The work was started in Guernsey in 1908 in a small way, and approximately 30 per cent. of the animals tested reacted to the disease. Evidently a serious state of infection had to be overcome. The work was pushed on, and during the years 1910–19, 2,426 cattle were tested officially and 191 reactors were reported from all sources. In the years 1924–25, 1,881 cattle were officially tested, and only two reactors were reported from any source. In 1926, 1,001 cattle were officially tested, and no reactors were reported from any source. Guernsey is very proud of the results, and can widely advertise her cattle as being practically tubercle-free. No cattle are allowed in except from neighbouring islands, and then only under test. Reactors were slaughtered and compensation paid.

An island in another part of the world on a far bigger scale did the same thing: Prince Edward Island, in Canada, took a vote of the farmers as to whether tuberculosis should be eradicated, and by an overwhelming majority affirmed the principle. Nearly 100,000 animals were tested, only ·5 per cent. reacting, and the island has been declared free. This is an interesting case in more than one way. It is sometimes said that tuberculosis in cattle is so rare in New South Wales that it is unnecessary to take any further action than has been taken in the past. Surely if the disease is as rare as is sometimes asserted, that fact would be an excellent argument for attacking it hard and getting rid of it entirely. Such was evidently the view of the Prince Edward Island farmers.

Apart from islands, many mainland countries have taken up the work. The United States is working on a colossal scale. Since the campaign started there, 30,000,000 cattle have been tested and over 1,000,000 reactors destroyed. At last reports there were 768 veterinary surgeons engaged whole time in the work and hundreds more part time. Recent reports say that the value of area work is very apparent. "More testing is being done and live stock owners are alive to the benefits obtained by regular annual tests. There is no doubt that in time all municipalities will require the tuberculin test of all dairy cattle, not as a temporary measure, but as a regular procedure." (Kiernan, *J.V.M.A.*, vol. xxiii, No. 1.)

In the State of Montana the number of reactors was reduced from 10 per cent. in 1911 to 8 per cent. in 1921. In Saxony a nation-wide voluntary scheme something after the accredited tubercle-free herd system, has been launched.

Remarkable success has been attained in Canada in practically eliminating tuberculosis in cattle within restricted areas or quarantine districts, and applications are being made from time to time to the Dominion Department of Agriculture to have additional areas brought under regulations for the

eradication of bovine tuberculosis. When the farmers of a district have requested this assistance, and the necessary proclamation has been issued, the cattle are tested and reactors slaughtered.

As an example of their results, the municipality of Grey may be quoted. In that municipality there were 6,457 cattle, and at the first test in November, 1925, 6 per cent. reacted; at the re-test sixty days later 1·4 per cent. further reactions occurred, but at the second general test in November, 1926, only ·4 per cent. reacted. So that Grey was well on its way to being clean within two years of first action.

The fact is, there is a world-wide campaign against tuberculosis, and Australia ought not to be behindhand. What has been done so far in Australia? Much good work so far as visual and manual inspection is concerned, a certain amount of milk examination, and now the commencement of the accredited herd system. In two places a definite further step forward has been made. To the city of Launceston must go the honour of being the first place in Australia to decide on a tubercle-free milk supply. Canberra, the Federal Capital, is the second place.

The Tuberculin Test.

Several times to-night reference has been made to the testing of cattle and as the use of the tuberculin test is an essential feature in the eradication of tuberculosis, it may be as well to give some consideration to it. Tuberculosis is, as you know, due to a particular organism known as the bacillus of tuberculosis. These bacilli can be cultivated on broth, and from this broth is made the substance called tuberculin. The organisms are killed and filtered out of it so that tuberculin contains no organisms and cannot set up the disease. This tuberculin is used both in human and veterinary medicine. If a little of it is injected under the skin, or into the skin, or placed in the eye of a man or animal suffering from tuberculosis, it causes what is called a "reaction," and the animal or man showing the reaction is called "a reactor." The reaction varies with the type of test used. When the subcutaneous test is used, there is a rise in temperature; when the eye test is used there is a discharge from the eye, and so on. If the man or animal tested is not suffering from tuberculosis, no reaction follows. Although this test may not be infallible, it is wonderfully accurate, and it is by means of this test that all the tuberculosis eradication work is being done.

Naturally, one does not rely entirely on the test, as there are some animals which show such obvious symptoms of tuberculosis that there is no need to test. These animals only constitute a small proportion of the animals actually affected. It is possible to inspect a herd and be unable to detect any sign of tuberculosis, and yet on application of the test to get 30 per cent. or more of reactions and to confirm the test on post-mortem examination. The greatest drawback to the test is that it does not give much indication of the extent to which an animal is affected. But, then, if an animal is affected it is impossible to say from day to day when that animal will start discharging tubercle bacilli in the milk and other discharges, and so be a

source of infection to men and animals. The drawback is, therefore, less serious than might be imagined, because the only safe plan is to get rid of every animal affected with tuberculosis. Of course, something can be done as indicated before by inspection, and a good deal of that is done in this State both by the officers of the Stock Branch and by the officers of the Board of Health.

Something can also be done to get rid of the most dangerous cows by a careful manual examination of the udders and a bacteriological examination of the milk. But this is only temporary, because a cow which to-day is healthy by those tests may, in a few weeks' time, be passing tubercle bacilli in the milk, and have the udder affected. The only way to make quite sure is to get tubercle-free herds by the application of the test, and by the culling out of reactors. These reactors may be sent to an abattoir where there is sound and strict inspection for slaughter. Any that are then not fit for human consumption would be condemned. The very slightly affected ones would be passed, as is done in every part of the world where scientific meat inspection is carried out. So, in order to eradicate tuberculosis, the tests must be used.

In order to encourage the creation of tubercle-free herds, the Department of Agriculture, in collaboration with the other States of the Commonwealth, agreed to test the herds of milk suppliers and stud breeders, providing the owners agreed to certain conditions. If this is done to all herds in a given area a tubercle-free area can be obtained. As we have seen, other countries have adopted this system quite extensively. The conditions naturally vary with the different countries.

How to obtain a Tubercle-free Area.

There are two objectives to be aimed at—first, that of making sure of a tubercle-free milk supply, and, second, that of making a tubercle-free area.

The two, of course, are not quite the same. A tubercle-free milk supply could be guaranteed by testing all cows supplying milk to the area, no matter where they were situated, and including the house cows supplying household milk, whereas a tubercle-free area would be gained only by testing all animals in the area. It may be possible to combine the two. That is to say, if there is a fairly self-contained community in which the milk supply of the area is drawn from the herds within the area, the testing of all animals in that area will automatically bring about a guaranteed tubercle-free milk supply. If, however, milk is drawn from a distance to the area it will be much more difficult to obtain a guaranteed milk supply. No doubt it might be possible by arrangement with those supplying milk from a distance to obtain the tubercle-free milk supply, but it is obvious that the difficulties are far greater than is the case where a community is producing its own milk supply. Moreover, there is not at present in this State any legislation under which such action could be made effective, while there is legislation which would enable

tubercle-free areas to be created and maintained. If it were decided to create a tubercle-free area, the first thing to be done would be to make a survey of the area and decide what the extent and boundaries of it would be. This, of course, would differ in every instance, depending on the spread of settlement. Where it was decided to get a tubercle-free milk supply as well as a tubercle-free area, the extent of the country from which the milk supply was drawn would also have to be considered.

Having decided on the area, the next thing would be to declare the area a quarantine on account of the suspected presence of tuberculosis. The test would then require to be applied to all the animals in the area and the reactors, if any, cleared out. If reactors were found, it would be necessary to repeat the test in the affected herds at a comparatively short interval, and repeat the general test in a year's time. No one would be allowed to bring cattle into the area unless they were tested. When the area was clean the quarantine would be changed into a quarantine line round a tubercle-free area to keep untested cattle from coming into it. The time necessary to create a tubercle-free area would depend entirely on the extent of infection found on the first test.

What advantages would follow the creation of a tubercle-free area? It must be admitted that at first the pioneers in such a movement would not perhaps regard themselves as gaining any advantage economically. Pioneers of all forward movements are apt not to gain much. One advantage from which others could be drawn would follow at once if the area was consuming its own milk. Everyone, particularly parents with young children, would feel safe as regards the milk supply, and if the area concerned were a tourist area, or one with many schools in it, the fact that milk supply was guaranteed tubercle-free would surely have weight, if brought to their notice, when parents were looking for a holiday resort or a school. It is remarkable how this matter has been taken up by the schools in country districts in New South Wales. The only wonder is they did not take it up long ago. On the economic side, it would be found as time went on, and tubercle-free areas were created, that a demand would arise for cattle from tubercle-free areas. This has been the experience in the United States—not at first, certainly—but as the areas increased and the matter was brought more directly before the public it was found the demand increased. In the beginning there would be a little difficulty in obtaining cattle by purchase on test from outside, for some owners object to selling on test. On the other hand, if it were known that a tubercle-free area was being created, other owners would lay themselves out to supply such an area, and would pride themselves on the fact that people wanting to purchase cattle on test could safely go to them with confidence that the cattle they proposed purchasing would be able to pass the test.

If a demand is created, somebody will always be enterprising enough to try and supply it. There is no reason why tubercle-free areas should not be created, and there is every reason why disease control and eradication should progress in this country on a par with what is being done elsewhere.

Paddock Feeding of Pigs.

A System that Produces Sturdy Stock Economically.

S. MEREDITH, Alstonville.

In view of the tremendous scope for pig-raising in this country, and the extreme suitability of the climate for conducting operations under the best of conditions, it is surprising that few farmers appreciate the opportunities nature has given them in this direction. The majority of pigs in this country are born and raised in either a small, bare yard with a shelter attached, or in a pigsty with a floor of concrete or other impervious material. This is a great pity, for most of the manure, both solid and liquid, is allowed to go to waste instead of being utilised to renew the fertility of the soil. The pig, like the horse and cow, is more or less of a roving nature. and although all three can be "stable-fed," they show to best advantage when allowed to roam the paddocks. Pigs, both breeders and fattening stock, are hardier and stronger in growth when fed under the more hygienic conditions, and stock in general show more resistance to disease, are more free from parasites, and make better and cheaper growth, both before and after birth.

The idea of encouraging the stock to obtain the majority of their food direct from the paddock in which they run has the following advantages:—

1. The cartage of food from paddock to sty is not necessary.
2. The land is fertilised by the even distribution of the pig manure (liquid and solid).
3. The pigs require less attention.
4. The pigs show quicker and cheaper growth.

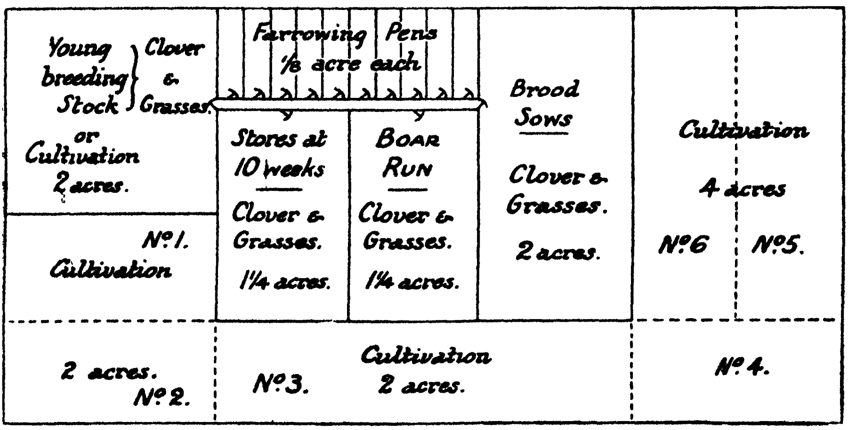
The breeder who first attempts the system after years of sty work must be prepared to learn from experience and to give a little extra attention, not necessarily of the brawn and muscle type, to his stock. The animals, as a rule, do not require much encouragement, but occasionally a mature animal that has been all its life in a sty, does not "do" very well in the open paddock, and seems to crave the old methods. Such an animal could be retained under the old system, and her progeny, if any are retained for breeding, should be turned out with others, when they will quickly learn to care for themselves.

The one possible disadvantage might be the initial outlay in either cash or labour, or both combined, for fencing, but I find that such outlay is like placing, say, £100 in the bank, and drawing it out at 10s. per week. The savings resulting from the paddock method of working will, by better results, repay the cost of the additional fencing within a year or two, and perhaps more quickly, and certainly there will be no loss.

An Ideal Lay-out.

To establish a pig farm, or a pig section of a farm, on this system, the first consideration is a careful survey of the land, so that faulty lay-out of the fencing at the commencement will not be the cause of alteration in the future, or of extra labour in handling the stock. Everything should be planned for the minimum of expenditure in labour; the accompanying sketch shows a farm lay-out that is nearly ideal.

It will be seen that provision is made for the brood sows to be put into the farrowing pen conveniently and quietly, to be put out into the boar's run later on when necessary, and finally put back into the brood sows' run for a further period of gestation. Allowance has been made for the young pigs to stay in the farrowing pen until the age of ten weeks (the sow being removed at eight weeks) and then put into the weaners' paddock. Later they may be separated, as required by circumstances, and placed for breeders and commercial fattening stock.



An Ideal Lay-out for a Farm Piggery.

The area devoted to crops will mainly be a matter of seasons and stock on hand. The commercial stock could be placed out into the paddocks Nos. 1, 2 or 3, or placed into No. 1, then into No. 2, and then No. 3 for the remainder of the feed that had not been thrown over the fence to the boar. Paddocks Nos. 4 and 5 are available for fattening, while the feed in No. 6 could be cut and put over the fence to the brood sows. It is not advisable to turn breeding sows on to a cultivated crop, in case of over-fattening, which must be avoided, but at odd times they may be used to advantage to finish off a paddock not quite eaten out by the fats, or a very poor crop.

A boar's run is provided for, but is not essential, although advisable, for while a quiet boar can run with the brood sows, a boar in any way bad tempered should always be kept apart.

The plan shown allows for expansion of cultivation paddocks according to the growth of the herd, and the market that the breeder is supplying; stores and porkers need less cultivation than baconers. Approximately

6 acres are allowed for breeders and progeny as a minimum, provided that the paddock for young breeding stock is not required; the balance (approximately 16 acres) can be used for cultivation. One man could usually handle the whole of the work by himself.

Two more pens could be erected, if desired, one close to the cultivation paddocks for "topping-off" if necessary, and the other, as far away as convenient, with, say, ¼-acre run, as a quarantine paddock for new stock. I would certainly place this as a necessity for the man who is purchasing his breeding stock.

As far as possible, water should be provided; at any rate in the farrowing and breeding runs. A line of piping running the length of the passage-way, with a break and a tap to each run, to allow of the water being renewed twice daily, is a good scheme. This short length, as will be seen by the sketch, would serve all but the cultivation paddocks, for which the design would vary, according to the situation of the paddocks and the location of the water.

The best slope to have is a north-easterly one, with plenty of shade available, particularly in the breeding stock pens. Fats and stores should have a shelter shed, as trees are not the best in cultivation paddocks. The soil need not be of the best, a good sandy loam or anything similar being quite suitable. The writer has stock running on clay soil grassed with paspalum, kikuyu, and couch grasses, with white clover, and they do well, the only additional attention being the supply of minerals. On this soil, twelve brood sows were running on a 2½ acre paddock.

Where a wallow is not provided, a good plan is to run a little crude oil (it is very cheap) along the back of each animal once a fortnight. This will spread over the body and go far towards the prevention of lice, although, unless these are brought in on other animals, there is little danger in an open paddock.

Some Interesting Experiences.

My own experiences furnish good examples of the benefits derived from the crops being harvested by the pigs themselves. An experiment was conducted for the purpose of testing a paddock for lucerne growing, and an area ploughed and planted in spring. Immediately adjoining, a quantity of self-sown Early Amber Cane sorghum was flourishing—the result of ploughing in some second-growth sorghum for green manuring—but as the spring advanced, summer grass, a pest in this part, began to show amongst the lucerne before it had grown sufficiently for a cutting to be made.

At the time I had twenty-three young weaners ready to leave the sows, and as I did not want to give them special attention at the moment, I turned them in on the crop. Twice a day they were given 6 gallons of skim milk (all I could spare) and they did splendidly. They were unable to push over the sorghum, but they soon learned to bite the butts until the stalk fell over, and then would chew away at it, leaving only the leaves and the fibrous parts of the stems. This meant a saving of labour, meals, &c., and

also enabled me to make use of the patch of lucerne which would otherwise have been wasted, as I could not turn cattle on to it at the time owing to the sorghum being present. The area of the paddock was 3 acres, and the pigs, when sold at 14 weeks as stores, had not been able to cope with the growth, and I turned in the breeders to clean it up.

On another occasion I planted maize, with soybeans between the rows, the area being about 2 acres. The big cobs were pulled when ripe and stored, and store pigs turned in on to the balance. They were given a little additional feed—pollard and meatmeal—because maize and soybeans are oily in substance, and with the green feed in the paddock would have pro-

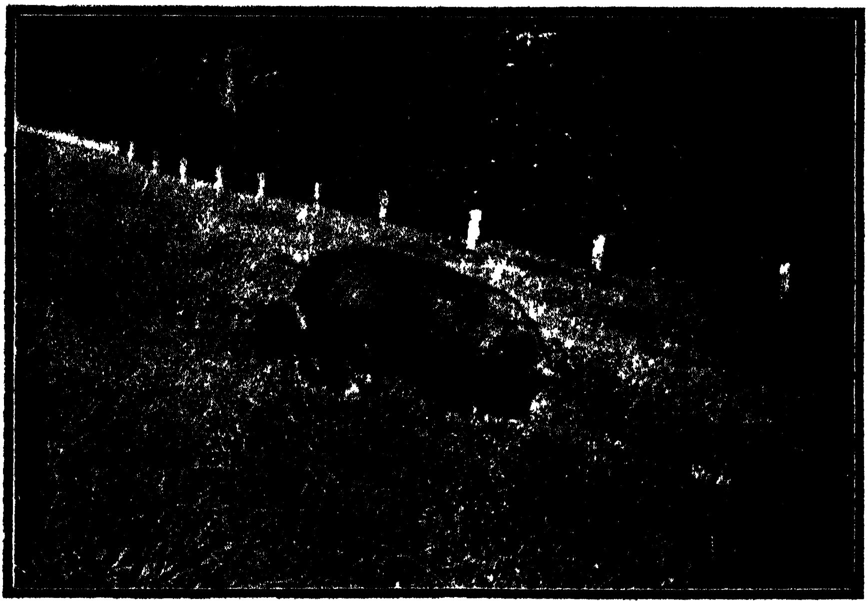
Sows and Gilts Grazing.
The pasture is a mixture of paspalum, couch nd kikuyu grasses with white clover.

duced very soft, flabby pork. The addition of the pollard and meatmeal (10 lb. pollard and 1 lb. meatmeal) improved the flesh and hardened the fat. A mixture of pollard and soaked coconut cake, fed as a slop (10 lb. pollard and 2 lb. cake) would have been equally efficient.

At the present time, I have a paddock very much infested with watercouch, right in the centre of my cultivation, and therefore useless from the point of view of stock feeding. Last spring, in an endeavour to choke it out, I planted Saccaline, but the late season resulted in a large quantity of couch and a small quantity of Saccaline. The breeding stock have just been turned in on to this to eat it out, and while in there they are receiving ½ gallon of skim milk and ½ lb. pollard and meatmeal (proportion of 4 of pollard to 1 of meatmeal) per head per day. This represents a considerable

saving of meals for the breeders, and a proportionate increase of profit on their progeny, while the exercise is excellent for them, and they are ploughing up the paddock in addition to top-dressing it for me.

With paddock feeding of pigs, there is no need for a fallow. A rotation of crops should be practised certainly, for the benefit of the whole farm, but fallow is only leaving capital lying idle. If breeders are kept in grass paddocks entirely, it will be necessary to give the paddocks a spell at least every two years—every year if possible—ploughing up any parts that are partially or wholly denuded of grass. Fresh grasses can be sown or planted, and then a short spell can be given. Be sure that rain falls and a good



A Young Boar Feeding under Hygienic Conditions.

growth occurs before the pigs are again turned in. If this is not done, the paddock is liable to become "pig-sick." A better system than merely planting grasses would be to plant a mixture of, say, rape, lucerne, and oats, let the whole grow up together, and then turn in the stock to feed it down, thus saving considerable feed, improving the pasture, and giving the land the needed renovation. This spell need only be a short one, and the land will not require manuring in any way, particularly if skim milk or buttermilk are used as part of the feeds, as these will supply lime in a form very readily available for plant-food.

The Crops to Grow.

The crops that can be used for fattening vary considerably according to districts, but maize can be grown almost anywhere where the rainfall is sufficient, and is undoubtedly a most economical and efficient feed. In drier

parts, a trial of the grain sorghums is suggested, firstly because these stand dry spells far better than maize; secondly, because the crop will be heavier, while its feeding value would be 80 to 90 per cent. of that of maize; thirdly, because it can be stored in the head as other grains are stored; and fourthly, because while there is a possible economic benefit in threshing the grain from the heads and grinding it, yet when the heads are fed whole the pigs do very nearly as well, the bulk of the head necessitating the animals chewing the grain thoroughly. I feed grain sorghums and the stored grain from sweet sorghums (the sweet stalks being fed to the stock at the time of harvesting the grain), and find that little of the grain passes through the animals, and that that little is utilised by fowls running in the pig paddocks in the afternoon. This saves feeding grain to the fowls in the evenings, and compels them to scratch for the grain. Thus waste is avoided, and possibly the saving of grain fed to fowls, plus the saving in not grinding the sorghum seed for the pigs would together more than compensate for the possible loss through incomplete digestion of the feed by the pig.

The real benefits of the paddock system are brought out more strongly if a costing system—even if a simple one—is adopted. This requires a little trouble, but will amply repay the effort made. A paddock has to be ploughed, harrowed, drilled and planted. Seed is worth its market price, even if home-saved from a previous crop, and cultivation has its value in cash. An estimate should be made of the yield of the crop in bushels, and the value at current market price charged to the pigs. If this is higher than cost (as it should be if the crop is a reasonable one), the balance should be credited to the farmer's enterprise, and not to the pigs. The pigs fatten on a certain quantity of corn worth so much, which, when added to the cost of other feeds grown or purchased and the cost of labour, gives the cost of producing the pork; the extra received from the factory or yard represents the profits made by the pig.

It will be found that the pigs from one litter will need more grain than the pigs of another to make 100 lb. of pork, and the profit from them is consequently less. This may be the fault of the boar or the sow, but it will pay to retain one or two youngsters from the more profitable litter to use as breeders, and it will be found that such strains will quickly increase profits, without extra labour for handling. Briefly, the system of costing should enable the cost of producing 100 lb. of pork to be obtained, and record the value of the meat, so that the differences between litters can be checked.

The keen feeder will find that his costing system will give considerable information in addition to the fattening qualities of strains of pigs, such as the returns from various feeds like rape, mangels, sugar-beet, thousand-headed kale and pumpkins. Some of these are scarcely in the class of concentrates, but, in spite of the large amount of watery matter in them, the returns from one acre very often compare very favourably with maize as regards pork production. There is no need for such crops to be harvested; the smaller pumpkins should be left on the vines and the pigs turned in to clean up the paddock, but if desired, large pumpkins could be

stored. Root crops are better harvested by the pigs; a small area should be penned off with netting attached to 3-inch x 2-inch stakes, and fed off.

With all fattening crops it is essential that a protein feed be given, and for this purpose the self-feeder can be used with a mixture of, say, ten parts pollard, two parts M.I.B. meatmeal, and one part linseed meal. With the green feed that is usually about the paddocks lucerne meal is not essential, and it would require experiment to see if any benefit would accrue from the use of it. If lucerne is growing on the farm, however, I believe a small quantity fed green would be beneficial, although even that is doubtful where root crops are being fed with plenty of green tops available. If plenty of green feed is available in the paddock, the inclusion of linseed meal as an economic feed might be tested, as the pigs would scarcely be likely to suffer from constipation, even with the other meals being fed. It is really a matter for the individual to test under his own conditions.

Two other root crops are worth mention, as they are practically perennial, viz., artichokes (Jerusalem) and sweet potatoes. If the pigs are removed before all the tubers are eaten out, the paddock harrowed over and closed, the crops will come again without planting. However, after three crops it would be advisable to eat the paddock right out and plant a legume for the sake of the ground.

Arrowroot is a crop that is coming to the fore lately, and is a good standby in a dry time; the tubers take about eight months to mature. They should be cooked, the water poured off, and fed to the pigs when cold, but being a fattening feed will require a protein feed, say equal parts of pollard and meatmeal, to go with them—not more than ½ lb. per head of the protein mixture per day.

The probability of a drought should be considered, as it would be very bad policy to have pigs in a dry year and no crops to fatten them with. Corn should be stored in the good years, and the protein-balancing feeds, which would have to be purchased at a cost not so very great compared with the price received for pork after a dry period, should be eked out with pasture (whatever is available).

The secret of successful pig-raising is the feeding of a balanced ration, together with sufficient minerals and plenty of clean water. The farmer's principal requirement is a keen eye for his stock, his crops and his feed costs, and if these are watched carefully the business will be successful.

Lucerne for Fat Lambs.

Lucerne stands alone as a grazing or fodder producing proposition. As a fat lamb raiser it has no equal. In November, when you are about to wean your lambs and green grass is scarce, the wool will get dry and the lambs will fail from being weaned, but with a lucerne paddock to turn them on you can not only retain the sap in the wool, but also improve your lambs and command a better market for them.—C. W. Langford at the Agricultural Bureau Conference at Forbes.

Grazing Sheep on Irrigated Lucerne.

EXPERIENCES AT YANCO EXPERIMENT FARM.

H. N. WILDMAN, H.D.A., Assistant Sheep and Wool Instructor.

To graze sheep successfully on irrigated lucerne some knowledge of the growth habits of the crop and of the methods that should be adopted in handling the stock on the stand is essential. The growing season of lucerne commences about September, but the time is governed by the conditions of the previous winter—a dry winter is conducive to earlier feeding-off and irrigating of the crop—and as a rule, the crops are not fed-off after May. It is during this period that stock are concentrated on lucerne stands used for pasture, and to obtain the best results year in and year out it is imperative that the feeding-off and subsequent treatment be arranged to have the same effect on the crop as though it were cut for hay. A stand will last for years when fed-off judiciously, but continuous stocking will kill it out; the sheep keep on eating off the young shoots and injuring the crown, thus causing constant "bleeding" and the ultimate death of the plants.

It is the usual practice to feed-off a paddock of lucerne with a mob of sheep sufficiently large to eat it out in ten days or, preferably, a week. During the summer months the sheep will leave the stalks after devouring the foliage, and the stand must then be mown and the sheep turned in again. A few hours to half a day is ample for this scavenging.

The paddock must be irrigated immediately the stock are removed to give the new shoots a good start; delay in applying the water at this juncture will result in a poor, spindly stand for the next crop. It may be necessary to give a further watering before the crop is ready to be fed-off again in a period varying from a month in the middle of the season to six weeks towards the latter end. Watering lightly during thunderstorm weather seems to benefit the crop. Lucerne is a highly nitrogenous fodder, and to provide a balanced ration it is necessary to run the sheep on grass occasionally.

The essentials of success in grazing sheep on lucerne may be briefly summarised :—

(*a*) Subdivide the stand in order to provide a rotation of paddocks and allow of proper treatment of them;

(*b*) Water systematically to ensure the growth of the young shoots and the growing crop;

(*c*) Judiciously stock the stand.

The following table shows the number of sheep depastured on some lucerne paddocks at Yanco Experiment Farm during the past season:—

Area of Paddock	Month (Season 1927–28).	Number of Sheep.	Period of Feeding.
			days.
1 acre (planted in spring)	December	30	2
	March	80	4
1 acre (established lucerne)	September	74	2
	November	63	3
	December	26	8
	January	62	4
2 acres	September	63	4
	November	159	2
	December	60	9
	January	66	7
	February	175	1½
2 acres	September	78	4
	November	150	3
	December	90	3
	January	92	2½
	March	175	1½
4 acres	September	1,140	1
	November	160	9
	December	*200	3
	January . .	175	8
	March	180	7
4 acres (two-year stand)	October	153	10
	November	240	6
	December	600	3
	January	*200	4
	March ...	140	8

* With lambs.

It is evident from the table that the lucerne is at its best about mid-summer.

Copper Carbonate and the Storage of Maize.

A note in a recent issue of the *Gazette* as to the utility of copper carbonate for the prevention of weevil infestation in stored seed wheat encouraged a farmer to inquire of the Department as to the possibilities of the dust for the control of weevil in maize in store. In reply, the Chief Instructor of Agriculture pointed out that seed wheat is treated with copper carbonate powder primarily for the prevention of the fungous disease "bunt," and for this purpose the copper carbonate is mixed with the seed at the rate of 2 oz. to every bushel by means of a machine that ensures that every grain is coated with the powder. It had been proved that if for any reason it was necessary to hold this treated seed for a year, weevil infestation was prevented by the copper carbonate, but he did not consider that the powder would cling satisfactorily to maize or other smooth-coated seeds. A cheaper and more effective method of preventing weevil in stored maize was to store the grain when dry enough in air-tight galvanised iron tanks and treat with carbon bisulphide.

Orchard Heating and Smudge Firing.

[Concluded from page 388.]

H. BROADFOOT, Senior Fruit Instructor.

EXPERIENCE and observation count for much, for a man who has them can usually tell about 8 p.m. whether a frost is likely to occur or not. He cannot tell, however, how many degrees of frost will be registered, so that to economise labour and expense and avoid unnecessary risks he should provide himself with an accurate guide. A special kind of thermometer has been prepared, which is exposed to atmospheric conditions similar to those to which the plants are exposed. This thermometer is connected by a wire with a bell in the bedroom, so that when the thermometer drops to a certain point, the bell is rung. If the area is large several thermometers are advisable, but thermometers should be placed in the treated area, so that check readings may be taken, thus making assurance doubly sure. Orchard heating is expensive, and an orchardist who practises it cannot run the risk of raising or maintaining the temperature at an unnecessarily high degree, nor, since he has gone to the expense of making preparations—should he neutralise his efforts by neglecting to make use of them.

In order to start the fires, a torch is very useful. It may be made by winding rag saturated in kerosene round a stick, igniting it, and carrying it from burner to burner.

It is well known that frosts generally occur on calm nights, but occasionally a freeze will occur accompanied by strong winds. One which occurred in 1910 in this State will be remembered by many growers. In such a case it is well nigh impossible to carry out orchard heating with success.

Factors in Frost Occurrence.

Some of the factors upon which damage by frost depend are as follows :—

(*a*) Orchards which have cover crops, or in which there is a dense growth of weeds or grass during the danger period are much more susceptible to frosts than orchards in which clean cultivation is practised.

(*b*) Frosts are more destructive in a dry season than in a wet one.

(*c*) Some species and varieties of trees are much more susceptible to the effect of frost than others.

(*d*) Locality and aspect are important conditions. If the orchard is planted in an area which is subject to frosts, and air drainage is bad, greater losses will be experienced than in an orchard in which air drainage is good.

Orchards differ greatly in aspect and situation, and it is quite a common occurrence to see the products of one crop badly damaged by frost, whilst an adjacent or contiguous orchard, in which varieties and altitude are the

same, may escape frost damage completely. In individual orchards there is a wide variation in the amount of toll levied by frost. The following divergencies and differentiations have been noticed :—

(*a*) Blossom buds and fruit on weak trees are more susceptible to frost than the blossom buds and fruit on healthy trees.

(*b*) If the sky becomes overclouded on a frosty night and remains overclouded until some time after sunrise, thereby preventing the solar rays from reaching the trees until the ice has disappeared from the fruit, damage is not likely to be serious. On the other hand, it is quite possible, as observation has shown, for fruit to be destroyed by frost long before the sun has risen.

It is not, however, at sunrise that all frost damage is done. Under some conditions a blanket of cloud protecting trees from the solar rays may minimise losses, but this is not invariably true; under climatic conditions which encourage rapid growth, the sap is likely to be watery and the freezing point high. Under such circumstances an ensuing frost will do more damage than an equally low temperature following a period of slow growth. It will thus be seen that the position is not without its complications. Several factors must be considered in determining whether any given temperatures will or will not damage blossom buds and fruits of different varieties of tree. It has happened that during one season a frost will be harmful to particular varieties in a certain locality, and in another season innocuous, although in both instances the buds or fruit had reached the same stage in development. Experience shows that it is impossible to state with absolute certainty, or, indeed, with any high degree of probability, the number of degrees of frost which will prove destructive to blossom buds and fruit, even if the buds and fruit are produced by identical trees, in identical places, under apparently identical conditions. It has even happened that during one season a frost has proved to be harmful, and yet in the same locality under apparently similar conditions a severe frost has wrought no destruction.

The Danger Period.

In New South Wales the danger period of varieties of deciduous trees extends over the time the buds begin to swell until a short time after the petals have fallen. The danger period varies in individual varieties. It is apparent that early blossoming lengthens the danger period. It happens rarely (though such cases have happened) that blossom buds have been destroyed by frost before they begin to function. Apple and pear trees are most susceptible to damage by frost at late pinking and petal-falling stage, and peaches, plums, and apricots just before the buds open, and when the calyces are dropping from the fruit.

In view of these facts it is fortunate that the opening of all blossoms does not synchronise, so that even if all buds about to open are destroyed, the size of the crop may not be materially reduced, for not even under the most favourable circumstances does every fruit ovary mature at the same time.

It is when a succession of frosts occurs as successive buds reach the sam stage, that the greatest damage results. Fortunately this happens infrequently. Total crop loss as a result of frost seldom occurs.

In the case of apples and pears, and with drupes, the danger of serious loss—of almost complete loss, indeed—is greatest when the petals of the pomes have fallen, and when the calyces of the drupes have just dropped, for all the fruit of each of these is in about the same condition, and the danger of losing the entire crop in a single night as a result of frost is much greater than during the blossoming period. The amount of damage done by fros to our deciduous trees during any season other than spring is almost, if not

Fig. 8.—A Fire Just Started in a Mound.

quite, negligible. Sometimes, indeed, in the autumn frost has damaged the the terminal shoots of walnut trees, but up to the present time this has not been known to cause serious damage to the tree. In one locality a number of Japanese plum trees have had their fruit and leaves destroyed by frost almost every year since they were planted, but these trees were planted in an area quite unsuitable for the production of this class of fruit.

In the case of citrus trees more or less damage has occurred as a result of frost during autumn and winter months. Orange, lemon, and mandarin trees have had limbs and branches destroyed, trees have been defoliated, and in some cases have been killed by frost. In some instances certain varieties of citrus trees have had their fruit rendered valueless by the effect of frost, but such damage seldom occurs. It is fortunately the exception, not the

rule. In certain localities newly planted citrus trees are very susceptible to frost damage, and it is usual to protect the trees for a few seasons according to the district, until they attain a size reasonably resistant to injury. A very effective method of affording protection is by the use of limbs of bush trees which are selected with plenty of leaves and placed round the young citrus trees. If these limbs lose their leaves before all danger of frost is over, they should be replaced with fresh material.

In the case of deciduous trees, frosts may occur which, while not completely destroying the fruit, may retard its growth, and cause such serious blemishes as russeting or malformation, as to destroy its commercial value. This is especially noticeable in some varieties of pears, and especially in

Fig. 9.—A Good Volume of Smoke from a Mound.
Photo taken some time after fire lighted. On a calm night the smoke would remain near the ground.

Winter Cole. When russeting is smooth and reticulate, it has little or no effect upon the commercial value, but when the russeting is rough, raised, and cork-like, development is seriously retarded, cracks appear, and the commercial value is greatly deteriorated. The Williams is similarly affected, but to a lesser extent. Malformation of apples and pears is brought about by frost destruction of some of the pistils. Development of the fruit thus affected is lop sided. It is asymmetrical. The side of the fruit in which the injured pistils are situated is very seriously dwarfed, as compared with the normal development of the other side of the fruit. Glou Morceau is particularly liable to such injury, and Packham's Triumph to a less extent.

It is worthy of mention that in the United States of America, where measures to prevent or to minimise damage by frost are extensively practised, the assistance of the Weather Bureau is enlisted. For instance, from San

Francisco frost forecasts are issued for the whole State, while other stations issue local forecasts. In some of the fruit-growing districts in which interest in frost prevention is sufficient to warrant the expense, a small corps of trained meteorologists is maintained. These men conduct their work along the following lines :—

They predict the expected temperature for each night.

Give advice to orchard growers in regard to orchard heating.

Conduct a temperature survey of each district, and endeavour to determine accurately resultant frost losses.

Conduct experimental work in connection with frost and with fruit protection, and

Include in their experimental work studies in connection with increasing the accuracy of forecasts for minimum temperature, determining with greater accuracy the temperatures at which damage to buds, blossoms, and fruits results, testing new devices for fruit protection, developing improved thermometers in connection with orchard heating work, determining the influence of cover crops on frost risk, measuring the amount of temperature inversion on different nights, investigating causes for variations, determining the character of air drainage on different types of slopes, measuring the value of smoke cover in preventing or lessening amount of heat radiation from the ground.

In the foregoing work local fruit growers' organisations lend valuable assistance, and bear approximately half the cost. In cases where it is necessary to heat frequently and over extensive areas, service such as the foregoing is essential to the securing of best results.

Smudge Firing.

In generating smoke as a preventive of damage from frost, damp straw, grass, or similar material is used. This method can be practised successfully only in localities in which there is little or no air drainage, for where air drainage is active the cloud of smoke moves so quickly away that it fails in its protective effect. The efficacy of the smoke screen does not depend so much upon the prevention or diminution of heat radiation, as upon the protection to flowers and fruit which it affords from the effects of the solar rays, with consequent reduction in the rate of thawing.

Fires which are depended upon to produce smoke screens should be started much earlier than fires which are intended, by heat production, to prevent frosts.

Smudge firing has been practised by some New South Wales growers, amongst whom is Mr. Mays, who has utilised the method in his orchard at Rydal. Mr. Mays has erected hollow clay mounds, simi'ar in shape to white ants' nests. These mounds are constructed with an aperture at the top, about 18 inches in diameter. The opening increases in diameter towards the base of the mound, in which a lateral opening is made to ensure a draught of

air. The interior of the mound is packed with some suitable dry material, such as leaves, straw, grass, stubble, &c., together with some less combustible green material. This ensures slow combustion. The material smoulders slowly and gives out a dense volume of smoke.

The advantages of generating smoke from such constructions are as follows:—

(*a*) They are not expensive to construct or to maintain.
(*b*) They protect their own contents against rain.
(*c*) They are easily lit.
(*d*) They do not occupy much ground space.

It may be reiterated, that generally speaking orchard heating has proved much more efficacious than smudging as a preventive of frost, and it is only under exceptional circumstances that smudging can be practised with any degree of success.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 „ 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 „ 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 „ 1928
Department of Education, Mittagong Farm Homes	30	22 „ 1928
Sacred Heart Convent, Bowral	11	23 „ 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 „ 1928
Dominican Convent, Moss Vale	4	24 „ 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	113	20 „ 1928
Marist Brothers' Training School, Mittagong	80	25 „ 1928
Blessed Chanel's Seminary, Mittagong	3	26 „ 1928
Waiaroi College, Orange	4	2 Sept., 1928
J. L. W. Barton, Wallerawang	16	11 Oct., 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	19 „ 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 „ 1928
Department of Education, Hurlstone Agricultural High School	33	10 „ 1928
Department of Education, Eastwood Home	16	16 „ 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 „ 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 „ 1928
Lunacy Department, Callan Park Mental Hospital	20	26 „ 1928
Miss Brennan, Arrankamp, Bowral	24	29 „ 1928
—. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 „ 1929
New England Girls' Grammar School, Armidale	17	12 „ 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 „ 1929
Lunacy Department, Kenmore Mental Hospital	99	17 „ 1929
Tudor House School, Moss Vale	6	22 „ 1929
Lunacy Department, Orange Mental Hospital	3	22 „ 1929
Australian Missionary College, Cooranbong	57	24 „ 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929

—MAX HENRY, Chief Veterinary Surgeon.

Notes on Passion Fruits.

EDWIN CHEEL, Curator of the National Herbarium, Botanic Gardens, Sydney.

THE various species of passion vines have for many years past attracted considerable attention in horticultural circles on account of the flowers being of a bizarre nature, and the colour of unusual brilliancy. Whilst in former years they were cultivated fairly extensively for their floricultural interest (as upwards of one hundred species have been described from various parts of the world), in more recent years they have commanded considerable attention in the fruit markets, as the agreeable acid flavour of the pulp of the fruits is very popular with many people who use them extensively in making fruit salads, and also for making beverages during the hot summer months.

The Passifloras.

The common passion fruit (*Passiflora edulis*) is so well known, being cultivated fairly extensively along the coastal districts of this State, that there seems to be no need for any special reference to it here. Some otherforms, however, which do not appear to be so well known in this State, are well worth some consideration, as the fruits are even larger than those of the common passion, and the flavour of the watery pulp is excellent. Those species worthy of special attention may be enumerated as follows :—

P. macrocarpa (Large-fruited Passion).—This is perhaps the largest-fruited passion of the whole genus. It very closely resembles the Granadilla in general appearance, and in the young state is almost indistinguishable from it. The fruits are larger and more rounded than those of the Granadilla, and the leaves are smaller and the stipules larger; the serrated bracts are also more rounded. The calyx-tube is shorter and more shallow, and the petals are of a rich violet colour, not pink as are those of the Granadilla. It has been suggested that this form is nothing more than an improved cultivated variety of the Granadilla, the fruits being more oblong, depressed at both ends, and longitudinally furrowed and somewhat resembling in general appearance a small vegetable-marrow, sometimes attaining a weight of 8 lb. It is extensively cultivated in Peru and other parts of tropical America, and should be given a trial here.

P. quadrangularis (Granadilla).—This plant is a lofty climber, with thick, square, distinctly four-winged stems, and large ovate-cordate, or nearly rotundate leaves up to 6 inches in diameter, or 6 inches x 4 inches when oblong in shape. The petioles or leaf-stalks are rather stout and have usually six glands, and more or less prominent secondary nerves diverging

from the midrib. The stipules are usually ovate-lanceolate, an inch or more in length, and the flowers very showy, about 4 inches in diameter. Sepals and petals are usually bright rosy-pink in colour and white on the face, with coronet-threads beautifully marked with alternate crimson-purple and white bands, and tipped with blue and white. The stamens are yellow, spotted with red. The tube of the flower is bell-shaped and very fleshy, as are those of *P. alata* and *P. macrocarpa*. The fruits are of an oblong form, usually yellowish-green in colour, growing to the size of a swan's egg, or about 6 inches in diameter, some weighing as much as 3 lb. The pulp is of a sweet acid flavour, very cooling in a hot climate. It is said to grow wild in Nicaragua, and is cultivated extensively in tropical America and several of the islands in the Pacific.

P. alata (Malcolm's Passion).—This was introduced into cultivation from the West Indies in 1772 by Mr. W. Malcolm, who grew it in his garden at Kennington (England) and had a coloured drawing of the flowers published in the *Botanical Magazine* in 1788. It is similar in general appearance to the Granadilla, but differs in the stems being only narrowly winged, and having usually only four glands on the leaf-stalk and fewer secondary nerves. The brilliancy and fragrance of the flowers are said to surpass those of the Granadilla, and the fruit is smaller and usually pear-shaped. There appears to be a variety or sub-species of this listed under the name *P. phoenicea*, figured in the *Botanical Register* on plate 1603, which differs in the flowers being of a rich deep scarlet and slightly different in certain other characters.

P. ligularis (Mottled Passion).—This is sometimes called Ample-leaved Passion, on account of the leaves being larger than those of closely related forms. It is a native of Peru and New Grenada. The leaves are large, and of rather thin texture, cordate or heart-shaped at the base, with rather long leaf-stalks (petioles), which are furnished with several ligules or stalked glands and large leafy stipules. The sepals and petals are of a yellowish-white colour on the face and slightly larger than those of the Apple-fruited Passion. The numerous coronet-threads are as long as the sepals and are mottled red and white with blue tips. In its native country it appears to produce its fruits freely without any artificial pollination, and they are reported to be of the size and shape of an orange, with pulp of excellent flavour.

It has been cultivated in the Hawaiian and other islands of the Pacific, and seeds were introduced into the Botanic Gardens, Sydney, in October, 1924, by Sir Joseph Carruthers, who stated that the fruit of the particular variety from which the seeds were obtained "is almost round and about the size of an ordinary tea-cup. The skin is bright golden and is hard, whilst the pulp is exactly the same as that of the ordinary passion-fruit, but much juicier and sweeter, with a delicious flavour and alwa }t-free from

acidity." Plants raised from the seeds brought by Sir Joseph Carruthers were distributed from the Botanic Gardens to various parts of the State for trial. Sir Joseph Carruthers also distributed seeds amongst personal friends, and plants cultivated at Maclean and Coff's Harbour fruited in November, 1927. They were of a good size (about 3 inches diameter), and the plant grown at Maclean had a moderately good crop of fruits.

P. laurifolia (Laurel-leaved Passion).—The leaves of this species somewhat resemble those of the Portugal Laurel, hence the specific name. It is more commonly called Water-lemon passion or Bell Apple in the Fijian Islands, where it is cultivated in private gardens, and generally regarded as one of the best of the passion fruits. The flowers are fragrant, about 3 inches in diameter, on rather short stalks supported by large rounded bracts which are glandular on the margin; sepals and petals are greenish-white, finely spotted with red, reflexed; coronet threads banded with violet, red, and white. Fruit oval, about the size of a lemon, and a yellow or dull orange colour when ripe. The rind or shell is tough, leathery (not hard as in other species, and when green has six whitish stripes from the apex to the base. In the tropics the fruit of this species is a great favourite, as the pulp is regarded as even more sweet than *P. ligularis*. It seems to require a hot climate and plenty of moisture, so that the northern rivers district and Queensland would seem more suitable for the cultivation of this species.

P. maliformis (Apple-fruited Passion or Sweet Calabash).—This is a vigorous climbing plant, native in many parts of the West Indies. In Jamaica it is frequently found in the woods, where it is said to form a principal part of the food of wild pigs. It is also used in tropical parts fairly extensively by European people for making fruit salads, and as a dessert, the pulp possessing a sub-acid flavour grateful in hot climates. In Fiji, especially at Lautoka, it is grown in private gardens, where it climbs trees, fences, and outhouses in a very vigorous growth. It seems to take the place of the common passion (*P. edulis*), as although the latter produces plenty of vine and foliage, it does not fruit freely. The leaves are large and quite entire, thinner in texture and not lobed as in the common passion. The flowers are also very showy and quite ornamental for flower garden purposes. The fruits are rather small, quite round, with a thick, hard, shell-like rind, which is dried and manufactured in the French colonies into snuff-boxes, bonbonieres and other toys, such as we sometimes see formed of the peel of lemons or of limes. Seedlings of this species were grown by the writer in 1918 in the Sydney district, but the frosts during winter killed the plants.

P. incarnata (Virginian Passion Fruit or Maypop).—Foliage and flowers similar to those of *P. edulis*, but the fruits are yellow when fully ripe and not purple as in the common passion. It seems to have been known for upwards

of two hundred years, but has been confused with the common passion; however, the glands on the petioles and the yellow fruits seem to be sufficiently distinct characters to separate *incarnata* from *edulis*.

Other Species of Lesser Importance.—In Australia there are at least four endemic species, which, although not of any great importance so far as the edibility of their fruits is concerned, are quite ornamental and might be improved if cultivated and crossed with other species.

The Sub-genus Tacsonia.

Some botanists regard *Tacsonia* as a distinct genus from *Passiflora*, differing mainly in its larger calyx-tube, but some of the true passifloras, such as *Passiflora quadrangularis* and *Passiflora Buchanani*, have long tubes, whilst on the other hand, some of the tacsonias have short tubes. All species of the sub-genus *Tacsonia* are natives of America, and chiefly grow at great elevation in the temperate region of the Andes. At least two species —*Tacsonia mollissima* and *Tacsonia mixta*—produce edible fruits. An interesting form of the latter, which seems to belong to the subspecies *Tacsonia quitensis*, has been cultivated for several years in various parts of the Commonwealth with more or less success under the name "Banana-fruited Passion." A form of the *mollissima* type has also been grown, but is not quite so common as the *quitensis* form. Although the vines of both forms grow quite freely and a wealth of bloom is also produced, they appear to be rather shy in setting their fruits except in rare instances. The fruits are occasionally offered for sale, and chiefly used for fruit salads.

The genus *Tacsonia* was established as far back as 1789 by Jussieu[7] to include certain plants having rather long tubular floral receptacles and floral characters very similar to those of the true passion flowers (*Passiflora* spp.). About twenty-five species have been recorded, and several of them have been cultivated chiefly for floricultural purposes. There seems, however, to have been a considerable amount of confusion in regard to the determination of the various species, particularly in regard to *T. mollissima*.

This was originally described by Humboldt, Bonpland and Kunth [6a], and is figured by Hooker in *Bot. Mag.* tab. 4187. In 1869 Hooker figured still another species (*Bot. Mag.* tab. 5750) viz., *Tacsonia eriantha* of Bentham[8] with the following remarks:—"A noble plant resembling in habit and colour of flower the well-known *T. mollissima* (Tab. nost. 4187), from which, however, it differs conspicuously in the white undersurface of the foliage and ong bracts . . ." In a footnote, Hooker states: "I doubt much thi (*T. mollissima*) being the true *mollissima* H.B.K., which has densely tomentose stems; it more resembles *T. quitensis* Benth."

It has been pointed out by Masters[8], however, that the plant figured as *mollissima* in *Bot. Mag.* tab. 4187 is the true *T. mollissima*, and that there were at least two species cultivated in England under that name. In the same work Masters points out that *T. quitensis* is a "finer flower, and is even more worthy the attention of the cultivator than the true *T. mollissima.*"

In addition to the above, a third species was described by Bentham[2] under the name *T. eriantha.* This latter is also figured by Hooker in *Bot. Mag.* tab. 5750. Masters, *l.c.*, regards this as only a more densely pubescent form of *T. quitensis*, and reduces it to a variety under the name *T. quitensis* var. *eriantha.* A comparative statement is drawn up by Masters[8] to show in what special points the three nearly allied forms above alluded to differ the one from the other. The main points of difference may be briefly given as follows :—

Leaves downy on both surfaces, especially on the lower face. Petioles purplish colour with a row of glands. Flower tube 2½–3 in. long, glabrous	*T. mollissima.*
Leaves nearly glabrous above, downy beneath. Flower tube nearly or quite 4 inches long, downy	*T. quitensis.*
Leaves nearly glabrous above, covered with snow-white down on the under-surface between the nerves, as also the tube of bracts and that of the flower	*T. quitensis* var. *eriantha.*

The fruits of the three forms appear to be very similar to each other in shape, size, and colour, being described as elliptical or pyriform, and of a citron-yellow or apricot colour, and about 2½ inches long.

In a paper entitled "Contributions to the Natural History of the Passifloracea," published in 1871 by Masters[9], a complete list of the known species is given, which includes 184 species of the true passion (*Passiflora*) and twenty-five species of *Tacsonia.* In connection with the latter Masters makes the following remarks :—"This genus was separated from *Passiflora* by Jussieu and has been generally adopted by botanists, not without a suspicion, however, that it is too closely allied to *Passiflora* to be truly generically distinct . . ."

Notwithstanding the above remarks, it is interesting to note that although Masters follows Jussieu in retaining *Tacsonia* as a distinct genus, he reduces *T. quitensis* to a subspecies of *T. mixta*, and *T. eriantha* of Bentham to a variety of the subspecies *quitensis.* Two other species are included under *T. mixta* in the same work, viz., *Passiflora longiflora* of Lamarck as a synonym, and *Passiflora tomentosa* Cav. as a subspecies, *i.e.*, *T. mixta* subspecies *tomentosa* Masters, and *Tacsonia speciosa* H.B.K. as a variety of subspecies *tomentosa.*

It will be seen from the above that the relationship between the species is very close, and even with the aid of coloured drawings it is somewhat difficult for the layman to separate them, but, as will be seen by a careful examination

of the plants cultivated in the neighbourhood of Sydney and a comparison with the descriptions cited, the "Quito Tacsonia" (*Tacsonia quitensis*) is the species that is most commonly cultivated in Australia, and usually known as "Banana Passion Fruit."

We have no exact data as to the introduction of this particular plant into Australia, but since 1909 we have received specimens from various parts of the Commonwealth for reports as to its identity and usefulness. The late Mr. E. Betche, in reporting on the specimens sent in for identification, was of the opinion that they were *Tacsonia mixta*.

In an article on the "Passion Fruit Family," the writer of these notes[4] suggested that its specific rank had not been definitely worked out, as two other species, viz., *T. mixta* and *T. mollissima*, have similar-coloured flowers. It was also pointed out in the same article that the fruits were occasionally offered for sale in fruit shops of Sydney, Manly, and certain parts of Western Australia.

Tacsonia quitensis.—Specimens of what may be regarded as *Tacsonia quitensis* have at various times been sent in to the National Herbarium for identification from round about Sydney. Plants raised in the Botanic Gardens, Sydney, were probably from seeds from fruit purchased from Mr. W. R. Smith in the Albany district of Western Australia by the late Mr. W.H. Maiden. In "Inventory of Seeds and Plants Imported," No. 53, 181, U.S.A. Department of Agriculture, Bureau of Plant Industry, 1923, the following statement concerning this species appears, and is of interest :—"This wild plant much resembles the cultivated *T. mollissima* in foliage, flower, and fruit. It grows abundantly in ravines and among brush at high altitudes in Northern Ecuador. The fruits are not much used by the natives, though they seem nearly as good as those of the cultivated Tacso."

Tacsonia mollissima.—This species is commonly known as "Tacso" in northern and central Ecuador, where it is freely cultivated, especially in the towns of Amliato and Tharra. The plant is a vigorous climber with three-lobed leaves somewhat like those of the "Quito Tacsonia," but instead of being glabrous, as in that species, the upper surface of the leaves are finely pubescent above and velvety-pubescent below. The corolla-tube is rather longer and thicker and the colour of the petals is not so rosy. The fruits are said to be very popular in Columbia as well as in Ecuador, and are commonly sold in the markets and are used to prepare refreshing drinks. They are also used for the flavouring of ice-cream.

During a recent visit to Tasmania I saw two very vigorous plants of this species at Hobartville and Sulphur Creek, each plant being heavily laden with fruit. It seems to be a much superior species to the Quito Tacsonia, and is worthy of more extensive cultivation in this State. Although it has been cultivated as far back as 1910, and flowering specimens have been sent in to the National Herbarium from Macleay River, Coff's Harbour,

and around Sydney, we do not seem to have received any ripe fruits of these plants. It is quite possible that it requires a cooler climate, similar to that of Tasmania, to enable it to fruit freely.

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Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.
Narrandera Sheep Show	July	17, 18
Forbes Sheep Show (K. O. Anderson).	„	18, 19
Peak Hill (T. Jackson) ..	„	24, 25
Tullamore (A. N. Cornett) ..	Aug.	1, 2
Trundle (W. P. Forrest) . ..	„	7, 8
Cootamundra Sheep Show (R. D. Beaver).	„	8, 9
Condobolin (J. M. Cooney) ..	„	14, 15
Gilgandra (G. Christie) . ..	„	14, 15
Illabo (R. Day)	„	15
Cargellico	„	21, 22
Wagga Wagga (F. H. Croaker) ..	„	21, 22, 23
Bogan Gate (J. Egan)	„	22
Ungarie	„	28
Grenfell	„	28, 29
Parkes (L. S. Seaborn)	„	28, 29
Junee (G. W. Scrivener)	„	28, 29
Forbes (K. O. Anderson)	Sept.	4, 5
Corowa (H. G. Norton)	„	4, 5
West Wyalong (A. Andrew) ..	„	4, 5
Young (T. A. Tester)	„	5, 6
Holbrook	Sept.	6, 7
Cowra (E. P. Todhunter) .	„	11, 12
Ganmain (C. C. Henderson) .	„	11, 12
Albury	„	11, 12, 13
Barmedman (S. S. Pembethy) .	„	12
Canowindra (W. E. Frost) .	„	18, 19
Murrumburrah (W. Worner) ..	„	18, 19
Temora (A. D. Ness) .. .	„	18, 19, 20
Boorowa (W. Thompson) . .	„	20, 21
Melbourne Royal	„	20 to 29
Barellan	„	26
Singleton	„	26 to 28
Hillston (S. Peevers) .. .	„	28
Ardlethan	Oct.	3
Quandialla (V. Talbot) .. .	„	3
Walbundrie (H. G. Collins) ..	„	3
Narrandera (J. D. Newth) ..	„	9, 10
Ariah Park (Mort Collings) ..	„	10
Bribaree (Jesse Austin)	„	10
Griffith (W. Sellin)	„	16, 17
Cootamundra (R. D. Beaver) ..	„	23, 24

Farm Forestry.

IV.—The Establishment of Windbreaks, Shelter Belts, and Tree-lots.

[Continued from page 367.]

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

The main features and advantages of a tree-lot on the farm area have been dealt with in detail in a previous article. In a brief recapitulation it may be stated that the function of such a plantation is to supply the farm with such timber requirements as fencing materials, fuel, and timber for outhouses, fruit cases, and general repair work. In special cases it can be made a source of revenue by the sale of its products, including ordinary logs for milling, pit props when in the vicinity of mines, fuel for country towns, or by raising of special crops, such as wattle bark, material for essential oil distillation, basket willows, or Christmas trees. In the drier parts of the State a plantation of fodder trees may be made as a reserve supply for drought periods.

In many districts the necessity for such work is not yet apparent, as the natural timber resources of the surrounding country are only partially exhausted, but in other parts the timber shortage is a very real problem. Moreover, it should be remembered that the tree-lot not only helps to utilise the whole of the farm area to its best advantage, but provides shelter for stock and crops, adds attractiveness to the landscape and increases the sale value of the farm.

Planting for Profit.

Planting for the purpose of obtaining revenue from the sale of products is, however, a matter which requires careful consideration of financial, marketing, and other problems. The landowner requires comparatively quick returns and a certain market for his products. Apart from special crops previously mentioned, the object of most plantations grown for profit is to produce good millable timber of a sort for which there is a demand. Undoubtedly the biggest demand in Australia is for softwoods, and the great majority of plantations will consist of these. Australia is rich in hardwoods, but by far the biggest percentage of softwoods used is imported from overseas, as our natural supplies are small and in the process of being rapidly exhausted. In New South Wales alone timber imports amount in value to one and a half million pounds annually, and we are almost totally dependent for the supply of softwoods on the Baltic States, Canada, and the United States. Although our hardwood forests are extremely useful, the big demand of the timber market is for softwoods, which constitute about 80 per cent. of requirements. A market for softwoods in

Australia would therefore appear to be definitely assured, and any crop of properly grown trees will always command a good price, especially as the shortage is likely to be felt more keenly in the near future.

Facilities for marketing form the next consideration; the plantation should be within easy hauling distance of the nearest railway or water transport, so as to reduce cost of marketing the products. The actual financial return to be expected from the growing of softwoods is rather indefinite, as few properly grown plantations have been actually marketed. The possibilities of the markets have, however, been tested on several occasions by the sale of plantations, chiefly of *Pinus insignis*. Although this species does not appear to be a first-class softwood, it has commanded good prices in the majority of cases. In South Australia 6 acres of this species brought in £2,000 after paying for milling expenses, the timber being mainly used for fruit cases. As estimate of the yield is generally held to be 100,000 superficial feet to the acre, which at 5s. per 100 super. feet, would bring in a return of £250 per acre. The cost (including planting, maintaining, harvesting and interest on the capital invested) is roughly £85 to the acre for a rotation of thirty years. The net profit would therefore be £165 to the acre, or an annual profit of over £5 per acre.

Before the landowner decides to plant an area for profit he should, however, consult the local Forestry Officer, or seek advice from the Forestry Commission, as to the possibilities of the venture. Special crops grown for profit will be referred to at the end of this article. The ordinary tree-lot, however, which is used as the source of timber requirements on the farm, although not primarily planted for direct profit, returns dividends in the form of timber and fuel supplies, shelter for stock and crops, and aesthetic improvements.

Choice of Site.

The underlying idea of the farm tree-lot is to utilise the spare parts of the farm area which are not considered suitable for raising profitable crops. Often such portions have soil considered poor from the point of view of ordinary crop production, but which will support satisfactory tree growth. On the other hand, unless land is valuable, the selection of a site should not be restricted to such parts, but, bearing in mind the value of tree products, a portion of better soil set aside. When planting for commercial profits it is especially necessary to see that the site selected will provide, as far as possible, optimum conditions for the species selected.

In many districts 10 per cent. of the farm area could be well devoted to tree growth. In any case, it is essential that the soil be deep, as shallow soil is not suitable for trees, with the exception of a few species. This is particularly the case in districts where the rainfall is not heavy. Most trees do best on a porous, well-drained surface soil with a fairly retentive subsoil, but usually some trees can be found which are suitable for any particular soil type. Where desirable, the site may be selected with a view of providing shelter or a windbreak for certain paddocks, or of forming a protective and ornamental setting to the homestead.

Choice of Species.

The choice of species, apart from the general considerations outlined in a previous article, will depend on the main object of the plantation. If fencing material or rough timber are required, then hardwood species will be the most suitable. For providing fuel, both hardwoods and softwoods are suitable, and quick-growing species like the acacias have special advantages. To provide timber for building, fruit cases, &c., softwood species

A *Pinus insignis* Plantation at Gosford.

or the lighter timbered eucalypts may be planted. If it is proposed to raise milling timber for sale, the plantation should consist of softwoods. For mining props and similar material some hardwood, like *Eucalyptus globulus*, should be planted. The actual choice will, of course, depend largely on climatic and soil conditions. Species suitable for the different districts in New South Wales will be given in a further article, but, in any case, the farmer should restrict his choice to those species, the successful growth of which is assured for his particular district.

The plantation may be a pure one, consisting of a single species, or a mixed one, consisting of two or more different species. Where a mixture occurs, the trees are often not so liable to damage by insects, fungi and wind, and tender species mixed with hardy ones are protected by the latter. Some species, such as red cedar and hoop pine, are hard to raise successfully except in a mixture. Pure plantations, on the other hand, are more easily handled, as the requirements of only one species have to be considered. In some cases the conditions of the locality are particularly suitable for one species only, and grow that species at its optimum. Conifers, such as *Pinus insignis*, are the most suitable for growing in pure plantations, and any plantings for direct profit will probably be limited to one species. In any mixed plantation it is not advisable to have more than two or three species, and species of approximately equal rates of growth are required.

The ordinary farm tree-lot is expected to supply all wood products of all sorts and sizes, so that a mixture of species is often desirable and even necessary. At the same time, any attempt at complicated mixtures should be avoided. A durable hardwood suitable for fencing material, &c., might be mixed with a softwood which would provide casing material and ordinary timber. The mixture may be of individual trees, lines, or groups. In many cases the total area of the tree-lot can be divided into two or three parts, each of which is devoted to the growth of one species only.

Preparation of the Ground and Planting.

The general principles of these operations have been dealt with in a previous article. Careful preparation of the ground by ploughing and cultivating helps considerably towards success, and greatly affects the rate of growth and rapid establishment of the plantation. Such preparation is not possible in general forestry work, but the landowner with only a small area will generally find it practicable, and certainly profitable.

Generally speaking, planted trees grow much faster and often to better advantage than naturally occurring trees, especially where they receive some cultivation in the first year or so after planting. Many Australians travelling in other countries have been surprised at the wonderful growth made by our eucalypts which have been planted there. The chief reason for this is that artificially created conditions remove many of the dangers and hardships which are imposed on naturally growing trees, and the absence of undue competition combined with the benefits of cultivation greatly favours improved growth.

Where conditions permit, the planting should be made as regular as possible, the distance between trees in the rows and between the rows themselves being kept constant. Such regularity facilitates cultivation and management. The lines may be kept straight by sighting with poles or stakes, or cords with coloured tapes at regular intervals may be used. Where the site is rough and broken with stumps, rocks or other irregularities, the plants will have to be distributed wherever possible. Trees may be planted

opposite each other, or opposite the spaces in alternate rows. The latter method is generally the better one. The plantation should, of course, be enclosed in a stock-proof fence to prevent damage by animals.

Spacing.

The spacing of the plants in the tree-lot depends on the nature of the species and the object of growth. Close planting makes for clean timber free of knots, so that where the timber is being raised for milling purposes the spacing should be fairly close. Where only fuel is required the question of spacing is not so important. In the majority of cases the most suitable spacing distance to adopt will be 8 feet by 8 feet, that is, 8 feet between the trees in a row and 8 feet between the rows themselves. This is the usual

A Three-year-old *Pinus insignis* Plantation at Bangalow.

planting distance adopted for conifers in New South Wales, but a closer spacing of 6 feet by 6 feet would probably produce cleaner timber, and, on poor coastal soils particularly, would help to prevent weed growth and establish the forest canopy. Close planting has the desirable feature that the trees grow quickly, shade the ground and keep out grass and weeds, whereas wider spacing lengthens the period during which cultivation is necessary.

Financial considerations and the amount of time that can be spared must also be considered, as closer spacing means more plants to the acre and more time occupied in planting. However, the 8 feet by 8 feet spacing is probably the best to adopt under most conditions; it gives a total of 680 trees to the

acre. Such a distance prevents undue development of the lateral branches, but does not involve too much work in thinning. Eucalypts may be spaced somewhat more widely, the spacing varying from 8 to 10 feet, or even more.

Cultivation and Protection.

The plantation should be cultivated for the first year or two in order to keep down weeds and conserve soil moisture. Cultivation should be continued until the canopy of overhead leaves is fully established. Any plants which failed to survive the planting operations should be immediately replaced. It is a bad policy to allow any replanting to be put off for too long a time, as the difference in growth tends towards the suppression of the smaller plants. Replanting, at all events, is rarely successful after the first year.

On very rich soils, where weed growth is particularly vigorous, the "cut and mulch" system is sometimes adopted. The weeds are cut down with a scythe and allowed to lie around the planted trees. The covering of dead weeds helps to suppress further weed growth, and acts as a surface mulch. In some plantations, particularly those of conifers, there is a considerable risk of damage by fire. Where such is the case, a break should be cleared round the area and every care taken to prevent fires starting during the dangerous season.

(*To be concluded.*)

Sweet Sorghum Trial (Ratoon Crop).

On Mr. W. E. Richen's farm at Upper Burringbar, one of the centres at which sweet sorghum trials were conducted last season (see *Agricultural Gazette*, December, 1927, page 933), ploughing and scuffling between the rows of the plots were carried out after harvesting, and a ratoon crop was obtained, with the following results:—

	Planted 17th Jan., 1927. Harvested, 28th June, 1927.			Ratoon Crop. Harvested, 18th Jan., 1928.			Total.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.
Saccaline	12	11	3	16	2	1	28	14	0
Honey	14	14	2	10	16	0	25	10	2
Collier	11	13	3	13	13	3	25	6	3
Sumac	8	4	0	12	7	1	20	11	1
White African ...	8	0	0	11	17	3	19	17	3
Gooseneck ...	10	7	1	7	3	2	17	10	3
Selection No. 61 ...	8	12	3	8	11	0	17	3	3

Crops at other centres have also been ratooned with very good results, but the weights have not been obtainable. There is not a very great demand for green fodder at this period of the year, and the ratooning of sorghum crops is not likely to become a general practice, but there are times when there is a shortage of succulent green feed for pigs. Succulent sweet sorghum is relished by pigs, and can be easily and conveniently handled, so that where a good germination has been obtained in the original stand, and the crop is reasonably free from weeds, a small area of ratoon crop, conveniently situated, would be useful.—M. J. E. Squire, Agricultural Instructor.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	T. Jones, Birdwood, Forbes.
	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	Hobson Brothers, Glenlea, Cunningar.
Canberra	E. J. Johnson, "Iona," Gunningbland.
	W. A. Southwell, Wilgrove, Galong.
	T. Jones, Birdwood, Forbes.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
Cleveland	W. Burns, Goongiwarrie, Carcoar.
	Manager, Experiment Farm, Bathurst.
Federation	E. J. Johnson, "Iona," Gunningbland.
	H. Owen, "Apple Grove," Duri.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Temora.
Gresley...	H. J. Harvey, Kindalin, Dubbo.
	Manager, Experiment Farm, Temora.
Hard Federation	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, Linden Hills, Cunningar.
Turvey	Quirk and Everett, "Narrawa," Wellington.
	Hannett Bros., "Bonefoi," Cunningar.
	Manager, Experiment Farm, Temora.
	Hobson Brothers, Glenlea, Cunningar.
Waratah	E. J. Johnson, "Iona," Gunningbland.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	Chaffey Bros., Nemingha.
	Manager, Experiment Farm, Trangie.
	B. J. Stocks, Linden Hills, Cunningar.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	J. Berney, "Kildara," *via* Cumnock.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Temora.
Wandilla	Manager, Experiment Farm, Temora.
Yandilla King...	Bradford Brothers, Nubba.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	Hobson Brothers, Glenlea, Cunningar.

Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Earliana	H. Johnston, Hoxton Park, *via* Liverpool.
Marglobe	Manager, Experiment Farm, Bathurst.
Sunnybrook	H. Johnston, Hoxton Park, *via* Liverpool.
Potatoes—	
Carman	Johns Brothers, Strathalbyn, Myrtleville.
	M. Hoare, Myrtleville.
Early Manistee	W. J. McPaul, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
	R. E. Ball, Stonequarry, Taralga.
Factor	W. J. McPaul, Richlands, Taralga.
	J. Howard, Richlands, Taralga.
	A. Webb, Richlands, Taralga.
	R. E. Ball, Stonequarry, Taralga.
	E. McAlister, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
Satisfaction	J. Howard, Richlands, Taralga.
	A. Webb, Richlands, Taralga.
	J. J. Maloney senior, Stonequarry, Taralga.
	M. Hoare, Myrtleville, Taralga.
Up-to-Date	Johns Brothers, Strathalbyn, Myrtleville.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

THE DIPPING OF LAMBS.

ON account of the prevalence of ticks and lice and the risk of quarantine, and so the stoppage of the sale of lambs, it was decided in 1926 to test the effect of the dipping of lambs on their subsequent growth. As a result of two tests, one in 1926, and one at the end of last season, it was proved that dipping, if carefully carried out, had no detrimental effect on lambs, even if only two months old.

A further test has since been carried out at Glen Innes to see what effect violent treatment at dipping time would have on lambs. It is understood that sheep should not be dipped when overheated, but lambs will naturally rush about more than older sheep. In this case twelve lambs, 4 to 5 months old, were driven quickly around the yards till they were hot and breathing very quickly, when they were put through the dip. They were weighed before dipping, a week later, and then again four weeks later.

The lambs showed no ill effects in their general appearance, and increased in weight. In the first week they increased an average of 5 lb., and the increase in the five weeks averaged 12¾ lb. An examination of the wool at the last weighing showed that in some of the lambs a break was noticeable in the wool.

During the trial the lambs ran on natural pastures. At a final examination of the lambs on 24th February, no difference could be seen between the hot-dipped and the ordinary dipped lambs, except that in three cases of hot-dipped lambs a slight difference, not amounting to a break, was noticeable at the part of the staple which would have been at the surface of the skin at time of dipping. This was caused evidently by the sudden change when being dipped in their overheated condition.—E. A. ELLIOTT. Sheep and Wool Expert.

Poultry Notes.

June.

E. HADLINGTON, Poultry Expert.

The first of this month should see a commencement made with incubating operations on farms where the advantages of early hatching are recognised. There are still some poultry-farmers who hesitate about hatching early because the pullets, particularly of the light breeds, mostly break into a partial moult about March in the following year. But if the question is studied closely and all factors are taken into consideration, it will be found that the early-hatched birds prove far more profitable than those hatched late in the season.

Looking at the matter in the light of experience it will be generally agreed that better development is secured in the early chickens, and the cockerels can be sold sooner than those hatched later in the season, and at approximately double the prices. Again, the pullets, if reared under good conditions, come on to lay before the end of the year and produce a considerable number of eggs before they break into the partial moult. Then, after coming through the moult, they make good breeders and are all the better for having had a short spell from laying. Such pullets would, on the whole, be laying before the hens, and thus their eggs would be available for early hatching.

Even with the mid-season pullets there is no guarantee that they will not break into a moult also, more particularly if an attempt is made to hatch a large number at the one time, and if, when about half grown, they are crowded into houses to make room for the later ones. This would be almost certain to cause a moult.

With regard to the late season chickens, it frequently happens that they are crowded into the brooders and receive a check, which results in poor development—the cockerels are sacrificed in a glutted market, and the pullets do not come on to lay as early. In some cases they hang back for two or three months during which time they are being fed without contributing to their keep. It is true that under good conditions the late-hatched chickens sometimes turn out satisfactorily, but late hatching cannot be regarded as sound practice.

Selecting Eggs for Setting.

The necessity for careful selection of eggs for incubation cannot be too strongly emphasised. All eggs used should be at least 2 oz. in weight, and although early in the season there is a temptation to put in eggs which do not come up to the desired standard, it is better to let the incubators go slack than to put in unsuitable eggs. The guiding factor in selecting eggs should be to use only those which are as near to normal as possible in shape, texture of shell, &c. All those with thin, uneven, and porous shells should be passed out, also those which are under 2 oz. in weight, as well as the unduly large ones.

Particular care should be taken with regard to the rejection of small eggs, because strong stock which will in turn lay large eggs cannot be expected

from undersized eggs, which are an indication of weakness. The aim must be to build up our flocks and maintain stamina to withstand the strain of high production, and the selection of the right class of eggs for incubation is one step in that direction.

The freshness of the eggs is a factor which will affect hatching results, and in this connection the older the eggs are (over one week) the less the chances of a good hatch, especially when set in an incubator. If set under a hen, eggs may be two or three weeks old and still hatch well. If eggs have to be kept over a week, it is a good plan to place them in a box and cover them with bran. They should be turned daily, and this can be done by turning the box, but when setting in an incubator it is not advisable to keep the eggs for more than a week.

Operating an Incubator.

Inquiries about how to work an incubator are frequently received, and with a view to meeting the requirements of those not experienced in operating these machines, the following instructions are given :—

Testing Thermometers.—At the beginning of each hatching season it is advisable to test all thermometers because they sometimes get out of order. The fact that they worked satisfactorily for one or more seasons does not ensure that they will continue to register correctly. The best method of testing them is to take a dish of warm water at a little over 100 deg. Fah., stand all the thermometers in at the same depth, and allow them to remain in for a couple of minutes. If a tested thermometer is available it should be put in with them and any that vary from it will be wrong. But failing a tested thermometer it can be taken that if the majority register the same they are correct and any others which differ are wrong.

Regulating Device.—The next important part of the incubator to look to is the regulating apparatus which in some machines is a thermostat, while in others it is a capsule. The thermostat consists of sensitive metal bars so arranged that by expansion or contraction they operate a disc which opens or shuts according to the temperature. These bars are not likely to get out of order unless strained or broken at the centre. Therefore, all that is necessary is to examine them to see that they are in good condition. With a capsule, a simple method of testing is to remove it out of its bracket and hold a lighted match underneath and about 2 inches away. If it is in order it will quickly expand, but if the expansion spirit has leaked out it will remain flat, in which case a new one should be obtained.

The regulating device should not be regarded as entirely self-regulating, and adjustments are necessary to meet the outside fluctuations of temperature.

The Lamp.—Before starting the season all burners should be thoroughly cleaned, and the best method of cleaning is to take out the wicks and boil the burner in soap and water with the addition of a little washing soda. New wicks should then be put in. The wicks and burners should be cleaned every day, preferably late in the afternoon, so as to ensure a safe burning light through the night.

A good method of cleaning is to put out the light, open the top, and turn up the wick about half an inch, remove any crust that may have formed on it, then turn the wick well down and brush the burner sleeve with a small brush such as a tooth brush, or if a corrosion is forming remove it by scraping with a blunt knife. Then turn up the wick a little above the level of the sleeve and press it level with the fingers, at the same time rounding the corners. Next light the wick and if the light is not burning evenly dab the uneven part with the fingers until a good, somewhat rounded light is obtained. In all burners will be found a small vent alongside the wick sleeve and it is important that this be kept clear, otherwise there will not be proper combustion. Another matter which will affect the evenness of the light is any dents in the burner cap, or wick sleeve.

Sanitation.—The incubators should be in a proper sanitary condition before starting the season. To ensure this the best plan is to fumigate them some time before it is desired to use them. This can be done by placing ½ oz. of permanganate of potash in a dish and pouring over it 2 oz. of formalin, which should be put in the machine closing it up for a few hours. Care should be taken not to inhale the fumes. Any parts of the incubator, such as the tray, or frame underneath can be rubbed over with a solution of formalin and water to clean them.

Working Instructions.

Heating Up.—When starting the incubator the temperature should be got up to 103 degs. Fah. and maintained at that for about twelve hours before putting in the eggs. After the eggs are put in it is as well to allow another twelve hours for them to become heated through before attempting to regulate the temperature. After this the temperature should be regulated to run steady at 102 degs. Fah.

Temperature.—The temperature should be kept at 102 degs. Fah. at the commencement, later increasing it to 103 degs. and continuing at this until the eggs begin to chip, this may occur as early as the nineteenth day ; the temperature can then be allowed to run up to 104 degs. or even 105 degs. until the hatch is finished. The bulb of the thermometer should stand just clear of the eggs. About half an inch above is the correct position.

Turning.—The eggs do not require turning for the first thirty-six hours, after which they should be turned twice daily up to the ninth day at least, but afterwards once per day is all that is absolutely necessary. There is no harm, however, in turning them twice a day right through till the time of chipping, when turning should cease.

Testing.—The eggs can easily be tested about the sixth day when with a good tester it is quite easy to pick out the infertile eggs. A simple method for testing on a small scale is to make a hole in the wall of the incubator room and on the sunny side to which the eggs can be held for testing. It is a good plan to place a sheet of glass over the hole, and it is necessary to darken the room during the operation.

Cooling.—After the sixth day cooling of the eggs should commence, allowing them to stand out of the incubator for a few minutes at first, and then gradually increasing the time of cooling as the hatch progresses, so that towards the end of the hatch they are allowed to cool for fifteen to twenty or even thirty minutes according to the temperature of the room. They should not, however, be cooled for thirty minutes as a regular practice, and cooling should cease when the first egg is chipped.

Ventilation.—Up to the sixth day, little if any ventilation is required ; after that time, in an incubator where the ventilation can be controlled, the ventilator should be gradually opened as the hatch progresses, and closed again at the first sign of chipping. In the case of a large hatch it may be found necessary to open the ventilators again somewhat when the hatch is practically over to allow more air for the chickens. If an incubator is not over-ventilated no applied moisture is necessary, because if the moisture in the egg is conserved there is sufficient to insure successful hatching. After chipping commences the door of the incubator should be kept closed until the hatch is over. If opened, a drying-out will result and a bad hatch ensue.

"Dead in the Shell."

The question is often asked as to the cause of the " dead in the shell " and in many cases all manner of causes except the right ones are suspected. Certainly, it is often difficult to arrive at an exact solution of the trouble, but a few common causes may be given which should be considered when an undue percentage of " dead embryos " is experienced. It must be understood, however, that some " dead in the shell " is inevitable, because there are always weaklings before as well as after hatching.

If the incubator has been run properly, and no experimentation has been indulged in, other causes may be looked to. One of the first matters to consider is the condition of the breeding stock, whether they are physically sound and in good condition or whether the male bird is getting light, or is infested with vermin. It frequently happens that the male bird allows the hen to get most of the food and of course he becomes poor. For this reason it is a good plan to give him a feed by himself in the middle of the day.

The feeding of the birds is also often responsible for the trouble in so far as they might be over stimulated by getting too much protein or condiments. Again, they might be surfeited with food, or the reverse might be the case. Careful feeding is essential to secure the best results in hatching and the effects of faulty feeding may be noticeable for some months, therefore, the method of feeding in vogue long before the eggs are laid must be taken into consideration. Another important factor is the age of the eggs, which point has already been dealt with.

An idea prevalent is that lack of moisture is the cause of " dead in the shell " because of the drying of the shell membrane and parts of the shell sticking to the chickens, which conditions usually accompany a bad hatch. But this always occurs no matter what the cause, and no amount of moisture would make any difference.

Orchard Notes.

June.

C. G. SAVAGE and H. BROADFOOT.

Pruning.

As it is always desirable to be abreast, if not ahead, of the orchard work, pruning should be energetically taken in hand during the coming month.

What should be the chief aim in pruning? It should undoubtedly be to prune the young tree so as to develop a strong well-shaped frame. In years to come the tree must bear a burden of fruit, and to do this it must be so treated that it will have sturdy limbs. If limbs are allowed to weaken by excessive unchecked growth, and to commence cropping whilst the limbs are too fragile to bear the weight of fruit, results may be disastrous. It will be most unsatisfactory and unprofitable to the grower to harvest a crop of fruit from trees if that crop has been produced at the expense of the well-being of the tree. If young trees are carefully selected and then sturdily built up the subsequent cropping must be satisfactory. It is important to observe that if a good framework has been induced, and if the tree is still growing vigorously, it is usually advisable to allow the tree to remain unpruned for a season. This will induce it to crop.

It scarcely needs urging that the characteristics of any tree must be taken into consideration. It is well known that peaches bear only on last year's growth and, unlike the apple and the pear, the trees do not develop fruit-bearing spurs. In old apple and pear trees these fruit-bearing spurs sometimes need thinning out to prevent their becoming too crowded. Factors which influence the growth and development of trees, such as soil, location, character, and influence of stock, manuring, cultivation, and spraying, all play their part in deciding the extent and nature of the pruner's operations, and prevent any rigid rule being laid down. Each tree has its own individuality and this individuality cannot be ignored by the pruner. The annual production of a crop, ample in quantity and good in quality, is the orchardist's aim, and to accomplish this aim the characteristics of each tree must be studied closely.

The main objects to be secured by pruning may be briefly stated as follows:—The economic working of an orchard in all its branches—cultivation, picking, spraying—the production of good bearing wood, improvement in appearance of fruit in so far at lease as size and colour are concerned, inducement of regular cropping, maintenance of the tree in a healthy condition, and the opening up of the central axis of the tree to the influence of warmth and light. If the pruner keeps the foregoing desiderata well in mind and shapes his operations accordingly he cannot go far wrong.

Ladders.

Among orchard necessities a strong but light ladder must take rank. It should, of course, be strong enough to meet all demands likely to be made upon it, but it should be light enough to be carried easily from place to place. It should be so constructed that it will enable the pruner to carry out his work expeditiously, and so that it can be placed in position without damage to the tree being operated upon. The use of a well-made, strong, serviceable, light ladder will economise time.

Planting.

Since root growth of deciduous trees commences long before the trees commence to shoot in spring, it is advisable to begin planting them as soon as possible. Root growth takes place in the nursery if planting is delayed and this plant energy is wasted when the tree is transplanted later. If the soil is dry, common sense dictates that planting should be deferred until rain falls.

Trees supplied from the nursery should not be accepted as a matter of course, or subjected to only cursory examination; but they should be looked over most carefully, and diseased, insect-infested, or ill-developed trees should be cast aside. Those which are fit for planting should then be placed in a trench and their roots should be covered with fine moist soil, from which they can be removed for planting as required. Dry winds and wet weather are unsuitable for planting. A puddle-hole is useful in hot windy weather if planting is proceeding. In this puddle-hole the roots should be dipped as the trees are removed from the trench. In the orchard, the depth of planting should be regulated by the depth at which the tree grew in the nursery.

Citrus Fruits.

In the marketing of citrus fruits some important points to be observed are:—

1. Exercise extreme care in handling.
2. Place fruit carefully in picking bags.
3. Carefully transfer fruit from picking bag to box.
4. See that the box has no protruding nails or splinters.
5. Do not jolt the fruit over rough roads.
6. Grade carefully for size and quality.
7. See that the sizing machine is functioning properly.
8. Use a clean case.
9. Pack neatly and tightly, but do not squeeze or jamb fruit into boxes.
10. Stack cases on sides.

Fungus Diseases and Insect Pests.

The removal, where possible, during the winter pruning, of all apple twigs affected with powdery mildew will greatly help in keeping this fungus in check. This step should be followed by spraying with colloidal (atomised or atomic) sulphur.

San Jose scale should be treated by spraying infected trees with miscible oil. Tobacco wash should be sprayed upon apple trees badly infested with woolly aphis. To break up clusters of aphis a good pressure is essential.

Ploughing.

During this month ploughing may be started. This prepares the soil and places it in a condition to absorb the maximum amount of winter rain, and to store it up for use by the tree in spring and summer. What spring weather may be like no one knows, and if ploughing is delayed there is a possibility that trees and crop might suffer

Improvements.

When weather conditions render outside work impossible or undesirable, harness, tools, implements, and equipment should be cleaned, sharpened, oiled. repaired, or painted as may be required.

Infectious Diseases Reported in April.

The following outbreaks of the more important infectious diseases were reported during the month of April, 1928:—

Anthrax	1
Pleuro-pneumonia contagiosa	10
Piroplasmosis (tick fever)	Nil.
Blackleg	Nil.
Swine fever	1

—Max Henry, Chief Veterinary Surgeon

Grain as Cattle Food.

In answer to a correspondent who had a quantity of cow cane on hand as winter feed for his cows, but desired to supplement it with grain, the Dairy Expert recently pointed out that some grains are very valuable as cattle foods.

Corn, which is grown on most dairy farms, is a very good grain for the purpose, and is also a good food for young calves, but as both cow cane and corn are rich in carbohydrates the two fed together would not constitute a balanced ration, being deficient in protein. In order to make up that deficiency it would be necessary to add some leguminous crop with a high protein content, such as lucerne, cowpeas, field peas, &c., or some concentrate rich in protein.

Oats, which is a most valuable grain for cattle food, is not so high in carbohydrates as corn, and is of more use in balancing a ration; it is of about the same value as bran.

Both these grains were recommended for use with the cow cane as the main foodstuff, the following being given as examples of balanced rations:—(1) Cow cane, 30 lb.; lucerne hay, 6 lb.; bran, 6 lb.; corn, 2½ lb. (2) Cow cane, 35 lb.; oats, 4 lb.; bran, 4 lb.

CONTENTS.

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Agricultural Gazette of New South Wales.

Field Maize Competitions.

ROYAL AGRICULTURAL SOCIETY'S CHAMPIONSHIPS, 1927-28.

L. S. HARRISON, Special Agricultural Instructor.*

ENCOURAGED by the generous support given by the Royal Agricultural Society and the keen co-operation of the local agricultural societies, farmers are commencing to accord the field maize competitions that measure of recognition that undertakings of such educational merit are entitled to. Four districts competed this year for the R.A.S. cups, one district (the South Coast) being represented by seven societies, and two societies (Inverell and Tumut) in another district having no less than twenty-three entries each. With the awakening to the advantages that these competitions offer, it is considered probable that growers in other recognised maize-growing districts will shortly be included in the list of competitors.

The New England and Inverell district was this year represented by the Armidale, Glen Innes, Inverell, and Tenterfield societies; Gundagai and Tumut competed for one cup between them; and the South Coast was represented by competitors at Pambula, Bega, Moruya, Nowra, Kangaroo Valley, Albion Park, and Camden. The North Coast, which was confined this year to one competitive district, was represented by the Manning, Macleay, and Bellingen societies. For the purposes of the competition the North Coast is normally divided into two sections—one from the Hawkesbury to the Macleay, and the other from the Nambucca north—but this year such remarkably sound and well-established maize-growing river areas as the Hawkesbury, Hunter, and Clarence were not represented.

The crops are judged on the following basis, the points under the first three headings being allotted at about the tasselling stage, and those under the remaining three at a second inspection when the crops are mature:—(1) Cleanliness of cultivation (maximum 25 points); (2) germination and stand (maximum 10 points); (3) general appearance and condition, evenness, &c. (maximum 10 points); (4) freedom from insect pests and diseases (maximum 10 points); (5) purity and trueness to type (maximum 15 points); and (6) estimated yield (inland maize is estimated for yield points at 3 for every 5 bushels, and coastal maize at 3 for every 10 bushels).

The Northern Championship.

The northern championship was awarded to Mr. F. Cornish, of Glen Innes, whose success was due to sound methods of cultivation on excellent New England black soil. The high merit of the crop was reduced, however, by a somewhat uneven type of crossbred variety; more attention should be paid to the seed question, and a suitable type variety, such as Wellingrove,

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* Mr. Harrison judged the four district competitions.

or a local Wellingrove x Large Goldmine cross, selected. Very little fertilising is done in the New England district, and the use of fertilisers is strongly urged upon maize-growers in those areas. Increased yields as the result of the use of superphosphate will be found in most instances to fully justify the expenditure for its purchase. No competitor among the eighteen visited at Glen Innes had used fertiliser on the competition block this season.

Mr. B. J. Bell, of Armidale, came second with a high-yielding entry of Large Goldmine. The paddock had been well cultivated, and was advantaged by the fact that it had previously carried lucerne for some years, which undoubtedly contributed to its fertility. The third prize went to the Cooredulla Estate, Tenterfield, which followed up the successes of previous years with a crop that left something to be desired from a selection point of view.

A somewhat unsuitable season affected to a certain extent the yields of most maize crops in New England this season—excessive rains early in the year having an adverse effect on crop-growing conditions.

The following table gives the points awarded in the northern championship:—

NORTHERN Field Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, etc. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
F. Cornish, Glen Innes	24	8½	9	7½	9½	42	100½
B. J. Bell, Armidale	24½	7½	8	7	11½	39	97½
Cooredulla Estate, Tenterfield...	21	8½	8	7½	9½	33	87½

*** Inland maize is estimated for yield points at 3 for every 5 bushels, and coastal maize at 3 for every 10 bushels.**

Tumut and Gundagai.

A Tumut crop won the competition conducted in this district, the crop being owned by Messrs. Butler Bros. The general competition in Tumut was good, and the win of Messrs. Butler Bros. was well merited. Maize-growing is looked upon as an industry of considerable importance in the district, and much care is taken with cultivation and seed selection by the best farmers. The winning crop was of Early Clarence, which, with Funk's Yellow Dent, may be regarded as suitable for the locality.

Crop yields were somewhat erratic, mainly because it is unusual to find an even block without sandy patches on the river side. As in New England, heavy rain caused some reduction in yield. Although maize smut is somewhat prevalent in the district, it was only seen in very few instances, showing that farmers are awake to the necessity for the use of clean land and clean seed.

At Gundagai the season for maize-growing was most unfortunate, an almost entire absence of winter rains preventing the storing of moisture in the soil for later use, and dry weather in the early summer affecting the crops considerably. The local winner, Mr. Scheuner, submitted an entry of Silvermine which was not very true to type, but the block of land showed evidence of excellent cultural preparation. Considering the season, the yield was quite satisfactory. This holding is on the Tumut River rather than the Murrumbidgee.

The awards in this district were as follows:—

TUMUT and Gundagai Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max 10 points.)	General appearance and condition, evenness, etc (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
Butler Bros., Tumut	24	7½	8	8	9½	36	93
W. Scheuner, Gundagai .	23	7½	7	7	10	33	87½

* See footnote to previous table.

The South Coast Championship.

The South Coast winner was found in Mr. J. B. D'Arcy, whose crop of Funk's Yellow Dent was of a high standard of type and purity, and quite suitable for the district. This variety and Iowa Silvermine, Yellow Hogan, Yellow Moruya, and Golden Beauty must be recognised as the standard varieties for the district. Mr. D'Arcy's block was on very old cultivation land, but was situated on the rich Jellat flats; much attention has been given to the cultivation requirements, both before and after planting.

The winner of the second prize was Mr. W. Caffery, of Nowra, whose entry was Hickory King that had been planted with the rows very close—2 ft. 6 in. The greatest care had been given to soil treatment both before and after planting, and fertiliser (equal parts of superphosphate and blood and bone) at the rate of 2 cwt. was applied. This plot was awarded the

highest points for yield in the whole of the South Coast competitions. The type of grain was fair for Hickory King, but selection could have been carried out more carefully, as impurities were noticeable.

Although the farmers who entered in the South Coast competitions are to be commended for their efforts in the direction of improvement by selection, they have not yet reached the stage where they might stop, and their knowledge of type should be used to improve further the varieties they grow. Funk's Yellow Dent, Fitzroy, and Leaming are varieties that might be considered for the Nowra district.

Mr. A. R. Parish, Kangaroo Valley, came third in this championship with an entry of Cox's Yellow. It was rather a mixed type, and without further investigation and comparative trials, together with hand selection to one definite type (there were two distinct periods of maturity indicated in Mr. Parish's crop), could not be recommended before Funk's Yellow Dent, Iowa Silvermine, Fitzroy, and Yellow Hogan.

The awards in the South Coast championship were as follows:—

SOUTH Coast Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, etc. (Max. 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max. 15 points.)	Estimated yield.*	Total.
J. B. D'Arcy, Bega	24	9	9	7	12½	35	96½
W. Caffery, Nowra	24	9	7	7	11	36	94
A. R. Parish, Kangaroo Valley	24	9	9	7½	10	33	92½

* See footnote to table on page 494.

The Championship of the North Coast.

The combined North Coast championship was won by Mr. J. P. Davis with an entry of Hickory King. This crop was of excellent appearance, and very thick in the rows, although the distance apart of the rows was 4 feet. The paddock had been down to lucerne for many years, and had been cropped to maize only the previous year. Fertiliser was used in liberal quantities, superphosphate being lightly ploughed in at the rate of 1¾ cwt. in September, and applied again at the rate of 1 cwt. at planting, and nitrate of soda at the rate of 1 cwt. being used as a top-dressing in December. For this district Fitzroy, Leaming, Pride of Hawkesbury, Yellow Hogan, Large Red Hogan, and Golden Beauty are recommended.

Second place was filled by Mr. R. S. McDougall, Bellingen, with a highly satisfactory crop of Fitzroy type, grown on excellently prepared and clean land. Mr. E. H. Ducat, of Temagog, Macleay River, was third with an excellent crop of Fitzroy which was a credit to the competitor.

Owing to the poor support given the competition by farmers on the North Coast—only three societies competing in the two districts—resulting in amalgamation into one district for competitive purposes, it is understood that the Royal Agricultural Society is only awarding a first cup, but it is interesting to peruse the points awarded the three entrants, and they are given below in the hope that a stimulus will be administered that will result in each section of the North Coast being represented by at least three competitors in future.

The points awarded the North Coast competitors were as follows:—

NORTH Coast Maize Championship.

Competitor.	Points awarded.						
	Cleanness of cultivation. (Max. 25 points.)	Germination or stand. (Max. 10 points.)	General appearance and condition, evenness, etc. (Max 10 points.)	Freedom from insect pests and diseases. (Max. 10 points.)	Purity and trueness to type. (Max 15 points.)	Estimated yield.*	Total.
P. J. Davis, Taree	24	10	9	7½	11½	40	102
R. S. McDougall, Bellingen ...	24	9½	9½	8½	10½	36	98
E. H. Ducat, Temagog	19	9½	9½	7½	11	33	89½

* See footnote to table on page 494.

The Need for Care in Selection.

There is an urgent necessity for care in seed selection. It is serious to have to state that in practically every crop submitted as an entry in the competitions this season the presence of root, stalk, and ear-rot diseases was noted. To obviate this as far as possible, and to keep those diseases under a measure of control, farmers are advised to adopt, as far as their own particular conditions will allow, the following suggestions:—Select seed from the standing crop, avoiding cobs from stalks that are broken or bent, prematurely ripened, those which pull up easily from the ground, or those that have brace roots up the stem. Cobs that contain split, mouldy, and discoloured grain should not be retained, and any such indication should be regarded as sufficient reason for excluding the whole cob. Avoid also cobs on which the grain is loose and shrivelled, selecting rather cobs of weight, with sound and well-filled grain.

Fallowing Competitions, 1927-28.

Some Further Reports.

WESTERN DISTRICT (PARKES CENTRE).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

During the period 1927-28 fallow competitions were promoted by the P.A. and H. associations of Parkes (seventeen competitors), Bogan Gate (fourteen), and Forbes (four), and branches of the Agricultural Bureau at Gunning Gap (nine competitors), Alectown (fourteen), Murrumbogie (five), and Goobang (three competitors); a total of seven competitions and sixty-six competitors. The Bureau competitions were associated with "field day" demonstrations and fallow judging contests, which proved even more successful than those of last year (see this *Gazette,* June, 1927, page 462), as many as forty people attending the gatherings at Gunning Gap, Alectown, and Murrumbogie.

The Season.

The rainfall recorded at Parkes for the fallowing period was:—June, 1927, 107 points; July, 31; August, 130; September, 227; October, 225; November, 273; December, 307; January, 1928, 323; February 551; March, 217 points.

The low rainfall during the winter months, and the necessity of reserving grazing areas for stock for as long as possible, contributed towards the rather late ploughing—August or September—of many areas. Not till the end of September did sufficient rain fall to penetrate to any depth, but the moderate to good falls from then onwards, and particularly the heavy rains of February, saturated all worked land to a depth of several feet. Some localities recorded from 6 to 9 inches during February, which caused considerable soil erosion, washing the ripened surface soil to distant places. The wet summer aided a vigorous growth of grass and weeds on all lands, and only by the frequent working of the fallows was the land kept in good condition.

The Parkes Competition.

The outstanding feature of the Parkes competition was the high standard of the eleven leading fallows, the workings of which ranged from five to eleven times, and averaged 7·1 times, excluding the ploughing. With such workings made at opportune times it is not surprising that almost perfect fallows were exhibited. Upon six of these blocks of 50 acres not one weed was found.

First place was awarded to Messrs. G. F. Field and Sons, Glenwillyn, with a score of 147 points. The soil was of grey to red silty loam, 12 inches deep, overlying a red clay subsoil. Being mouldboard ploughed 4½ inches

in July, 1927, it was worked seven times with the combine, no other implement being used. The outstanding feature of this fallow was the evenness and mellowness of the mulch, which was 2½ inches deep. Such a mulch may be a little deep with some soils when the sowing season is near, but with silty loams of this nature deep workings avoid dusting, and produce a ripened mulch which lessens the defect of caking. Disc implements or harrows were not used.

Second place was filled by Mr. W. B. Cheney, Velvedere, who scored 145 points. The chocolate loamy soil, with a few small outcrops of quartz gravel, was ploughed 4½ inches in September, 1927, and worked eight times, the combine being used four times and the harrows four times. The mulch was 2 inches in depth, moderately even, and nicely ripened; full points were scored for cleanliness and compactness.

Bogan Gate Competition.

The Bogan Gate P.A. and H. Association promoted its second fallow competition this year, and the vastly improved standard of the exhibits must be a pleasing feature to the Association. When commenting upon the 1927 competition, comparison was made with the Parkes exhibits, showing the rate of improvement that may be expected. It was hardly thought improvement would be so rapid, and considerable credit must be given to the interest and support given to the Association by the district farmers, and particularly to the good work being performed by the Gunning Gap branch of the Agricultural Bureau in promoting fallow judging contests.

First place was filled by Mr. E. J. Mill, Durran, with a fallow of black to chocolate clayey loamy soil, self-mulching in type. The ground was disc cultivated in June, 1927, to a depth of 2½ inches, harrowed in July; worked five times with a duck-foot scarifier, twice with a combine, and twice with an implement known as a cultivator harrow; eleven times in all. The result was a very good fallow, with a well-ripened mulch 2 inches in depth, which scored well under all headings, and totalled 146 points.

Mr. A. A. Wyatt, Eagle Farm, was placed second with a fallow of red to chocolate loam soil; wheat was sown in 1927 but failed to germinate, and the land was combined in September, December, January, and March. Having a nicely ripened mulch of suitable depth, well compacted subsurface soil, and being almost free of weeds, it scored well in all sections, the total award being 143 points.

Forbes Competition.

The Forbes competition was rather disappointing as regards the number of entries, but the standard of the fallows was high. First place was filled by Mr. R. E. Gunning, Clothilde, with a total score of 143 points. The soil of grey to red heavy loam was mouldboard ploughed in June, 1927, and worked four times with the combine. Though the mulch was slightly deeper than a standard fallow should be, it showed to advantage this year, as soil erosion was thereby retarded.

Mr. R. Kirkman, who is share-farming at Wowingragong, was placed second with a fallow of deep red loam soil, which was disc ploughed in August, worked with the combine five times, and once harrowed. It scored well for cleanliness, was of satisfactory compactness, but lost a few points because the mulch was a little irregular in depth. Total points, 141.

The Bureau Competitions.

The Bureau competitions are proving of even greater value than those promoted by the P.A. and H. associations. The area of country within which the influence of each branch is felt is small, and lends itself to the stimulation of a competitive spirit, a desire to see what the other chap is doing, and a wish to learn all that neighbours or the instructor can teach. The fallow judging contests proved most helpful in emphasising defective conditions of each fallow.

The winning fallows of each competition were entered by:—

Gunning Gap—1, A. A. Wyatt, Eagle Farm (Entry No. 1), 143 points; 2, A. A. Wyatt, Eagle Farm (Entry No. 2), 142 points.

Alectown—1, G. E. Marshall, Blighty, 138 points; 2, A. Wood, Sandhurst, 134 points.

Murrumbogie—1, L. J. Matthews, Noorla, 140 points; 2, S. Roberts, Forest Hill, 139 points.

Goobang—1, H. E. Ward, Gwenvale, 147 points; 2, S. A. Mason, Curra Vale, 145 points.

Comments.

Owing to the lack of winter rains the early-ploughed fallows did not have much advantage over those which were prepared later, and until the heavy summer rains very few subsoils contained an adequate supply of moisture. The heavy and continuous rain, however, corrected this deficiency, and enabled all the fallows to be placed in good condition, provided they received the necessary workings.

A section of the award table worthy of comment is that of cleanliness. In this section many of the fallows scored the maximum points, which means that not one weed was found over the whole of the blocks. In view of the wet summer and the favourable conditions for weed growth this is indeed creditable, and demonstrates perhaps more than anything the keenness of the farmers to produce ideal seed-beds. Where a few weeds were in evidence they were only little more than seedlings which had made their appearance during the last two weeks.

Compactness was also of a high order. The frequent workings made necessary by the substantial rains no doubt largely accounted for this, but full credit must be given to the wisdom of the farmers in knowing when and how to cultivate to produce the level, compact surface so desirable for the quick and safe germination of the wheat grain.

The finishes made by the plough were in most cases eliminated, and the depth of mulch and degree of compactness corresponded to the rest of the paddock. Headlands are receiving more attention, and those with tractor

power are working the paddocks as close to the fences as possible, thus lessening the risk of firing the fences and reducing the risk of weed infestation to the rest of the paddock.

The scores for mulch showed the most difference in the points awarded. We have now reached a stage in our farming knowledge when the effects of various mulches require close study. As a general guide mulches should be from 2 to 2½ inches in depth, but opinions are being expressed which favour shallower mulches in some soils. The objective should be a mulch deep enough to prevent evaporation from the compacted surface during the summer and autumn months, and yet shallow enough to allow the seed to be planted in moist, firm soil, and for the seedlings to readily push their way above ground. Endeavours to reduce the mulch beyond this point serve no useful purpose, and allow a risk of loss of soil moisture. Then again it seems advisable, especially with soils that tend to run together, to have as great a depth of sweetened, mellow mulch as is reasonably safe. A ripened mulch will not set to the same degree as a raw, out-of-condition surface.

With regard to the chocolate to black clayey loam (self-mulching type of country), a reasonable depth is advocated. Observations have shown that a mulch of 1½ inches is not sufficient to retain moisture.

THE MURRUMBIDGEE COMPETITION.

L. JUDD, H.D.A., Manager, Temora Experiment Farm.

This year was by no means a favourable one for the production of high-class fallow. The repeated heavy falls of rain experienced after the droughty period made the control of weed growth a formidable problem, and much care had to be exercised in cultural operations to preserve a suitable mulch. As regards moisture content, naturally all fallows were heavily charged near the surface, discrimination being only possible by a close inspection of the lower levels from 18 inches to 2 feet. Fallows of the class submitted were evidence of thorough and careful working, and displayed proof of thought and study having been given to their preparation. The economic position to-day will not permit of the adoption of slipshod methods of growing wheat, and a persistence in their use must lead to failure.

The preparation of a fallow calls for study and clear thinking, and a thorough knowledge of the underlying principles of soil culture, with particular reference to peculiar local conditions. Recommendations along general lines can be given for the preparation of a fallow, but it rests with the farmer to experiment to discover the finer and more detailed requirements of his own particular class of soil and conditions. Even a variation of working will be found essential on various paddocks of the same farm. The system of cropping, the care or abuse of a paddock in past years, its organic matter content, or its special class of soil, are all problems deserving of and necessitating careful study.

The Leading Fallows.

The winning fallow was certainly a credit to Mr. J. A. Goldsmith. The preparation and cultural operations generally had been carried out with thoroughness and care, the exhibit presenting a pleasing appearance at judging. The entry comprised two paddocks totalling 155 acres. The first was mouldboard ploughed in July 4½ inches deep, harrowed end of July and again in August, springtoothed in September and again in October, worked with the tine scarifier in January and again in February. The second paddock was mouldboard ploughed in July 4½ inches deep, harrowed twice in August, springtoothed in October, scarified in January and again at the end of February. From the appearance of the fallow all cultivations had been carried out at opportune times for the destruction of weeds and formation of a good mulch.

Second place was occupied by Mr. A. E. Armstrong with a very creditable long summer fallow, which was evidence of the suitability of the practice to his conditions. The mellowness of the soil in this entry was a pleasing feature, and the long fallow had resulted in excellent compaction of the seed-bed. Unfortunately the mulch was slightly on the fine side. This fallow could have been improved by the use of a scarifier from harvest to time of inspection. However, it was of high standard, and undoubtedly one which should give a good account of itself at harvest. The land was springtoothed in March, mouldboard ploughed in June, July, August, harrowed in September and again in October, and springtoothed in January.

Third place was awarded to Mr. W. J. McGrath, whose exhibit consisted of one paddock 180 acres in extent. The paddock was mouldboard ploughed 4 to 4½ inches deep, harrowed in August and again in October, springtoothed in October with the narrow points. Portion was scarified with the rigid tines and portion springtoothed in February. The major portion had been treated in a similar manner again before judging. This exhibit was of high standard.

Some Comments.

All competitors were fully alive to the advantages to be derived from a farm flock. The ability of sheep to convert useless growth and fodder into products such as wool and mutton makes them a side line which no wheat farmer can afford to neglect. The valuable work sheep do in bringing about the desired consolidation of the fallow is not fully realised. Further, it is interesting to note that the droppings are one of the most valuable forms of organic matter, and from this viewpoint alone sheep must in the future receive more attention than in the past.

In numerous cases a reduction in the area sown to wheat and the adoption of more advanced methods, combined with an increase in the flock, would be followed by a considerable gain in the net return from the property. The results of present methods point to a necessity of viewing our operations as "sheep and wheat" in place of "wheat and sheep" as now. With present prices for sheep and wool no one can afford to farm on out-of-date lines.

Wheat-growing only becomes a successful commercial proposition by the adoption of modern and approved methods and the judicious use of sheep.

The time has arrived when the important matter of soil renovation must receive consideration. Although to fallowing must be given the credit for the progress and present high standard of wheat-growing, we must realise that it is not without its shortcomings. It is recognised that the effect of bare fallow and cultivation, particularly summer cultivation, is the gradual burning and waste of organic or vegetable matter in the soil. The need for restoration of the organic matter content of our soils has not received the consideration its importance warrants. To this fact may be attributed a lot of the minor scouring observed in places during the tour.

In soils which have been carelessly farmed over a period of years it is noted there is an absence of that pleasing mellowness and good mechanical and physical condition. Instead we find there is a pastiness in the soil, coupled with a marked tendency to run together following rain, and in turn difficulty is experienced in preserving that desired cloddy mulch.

Humus, or decaying organic matter, surpasses every other ingredient of the soil in improving water-holding capacity. Not only do soils heavily charged with humus contain more moisture, but they possess the valuable feature of giving off the water by evaporation at a slower rate than soils depleted or deficient in this valuable ingredient. This is a point of particular interest to farmers in our wheat area. Humus also provides the necessary food for bacteria, and promotes biological and chemical activity, thereby making available plant-food in a highly soluble and readily available form. The value of humus in improving the mechanical and physical condition of the soil is well known; the heavier soils are more readily worked and the lighter classes of country made more mellow by its addition. Originally our soils were well supplied with vegetable matter, but cropping has resulted in gradual depletion.

The use of sheep is undoubtedly the most practical and remunerative method of restoring organic matter. The growing of fodder crops to be fed off is an essential to the system, the droppings and residues being valuable for restoring fertility, and by their rotation materially assisting in combating disease. In a fat-lamb proposition, fodder crops are one of the greatest aids in attaining that succulent bloom which the present market conditions demand, and in an unfavourable year are often the deciding factor between success and failure.

Crop rotation has undoubtedly received scant attention in the past, but with the change in the economics of the industry, the favourable markets for sheep and wool, and a more general realisation of the advantages of crop rotation, this practice must receive the attention its importance warrants. Increased land values also demand that producers shall obtain more certain and remunerative returns.

The top-dressing of pastures aids indirectly in returning organic matter to the soil by means of the increased number of sheep that can be carried.

Outstanding Lessons from the Competition.

1. Early preparation of fallows undoubtedly gives superior results.

2. Long summer fallow should occupy a place in an organised system of cropping on every holding.

3. The mulch must be maintained in summer. Lack of mulch means loss of moisture; as the crop harvested is in direct ratio to the moisture conserved, other things being equal, growers cannot afford to neglect the mulch.

4. Weed growth is most efficiently and cheaply dealt with in the early stages; cultivate early and save money.

5. Unsatisfactory results follow the use of the disc cultivator when working fallow.

6. When land is not ploughed in ideal condition, the harrows should precede the springtooth in the spring cultivation.

7. The use of the springtooth in spring eliminates clods in the seed-bed.

8. The use of the rigid tine scarifier from harvest to seeding results in a more even seed-bed and a more uniform depth of mulch.

Sheep on the Far South Coast.

THE Sheep and Wool Expert (Mr. E. A. Elliott) recently visited the Bemboka district at the request of the local branch of the Agricultural Bureau, to investigate the prospects of sheep-raising in that locality. The following notes are from his report:—

"I am of the opinion that sheep will do well on the poorer country, if reasonable care is taken to keep them healthy by drenching, dipping, &c. Fat lamb raising should be possible on some properties where a fodder crop can be grown, but on places where no cropping is done a dual-purpose type of sheep should be bred, as the natural pasture will not be sufficient to get the lambs into prime condition. For fat lamb raising under the prevailing conditions the Romney Marsh is the most suitable breed of ram, but for dual-purpose sheep the Corriedale should prove better, as the wool clip would be more even in quality. This breed will produce a larger-framed and more valuable carcase than the pure Merino, and will be more hardy. If pure Merino sheep are run, large-framed ewes should be selected, with a medium to fine class of wool. There appears to be a tendency for strong Merino wool to become stronger and lacking in quality when bred under South Coast conditions, but if medium-woolled sheep are selected this deterioration should not be so marked.

"The distance from market, and the fact that to reach Flemington the sheep must be taken 26 miles to the railway, about 11 miles of this being a steep mountain road, will be an obstacle against fat lamb raising unless the lambs can be brought up the mountain by motor-lorry. This is the mode of taking pigs to rail or market on the hilly roads of the South Coast, and it should be possible to move fat lambs in the same way.

"The district is experiencing a very good season, and except for signs of worms in one flock, the sheep are, to all appearances, quite healthy and free from ticks and lice. There is an excellent growth of feed, but the ground is dry and there is no sign of foot-rot."

Varieties of Rice.

W. POGGENDORFF, B.Sc. (Agr.), Assistant Plant Breeder.

WITH the growing importance of rice as a crop in New South Wales, a stage has been reached at which settlers on the irrigation areas have become more interested in varieties and their characteristics. This is evidenced by the differences of opinion amongst growers in the identification of varieties, which is already a matter of some moment since certain varieties are now recognised to be better yielding than others, or to have features which commend them or otherwise.

It is felt that an accurate description of varieties and means of identifying or distinguishing them will be helpful at the present juncture. Only two varieties are largely grown in New South Wales at the present time, viz., Caloro and Colusa, and this paper indicates how they may be distinguished.

Caloro.

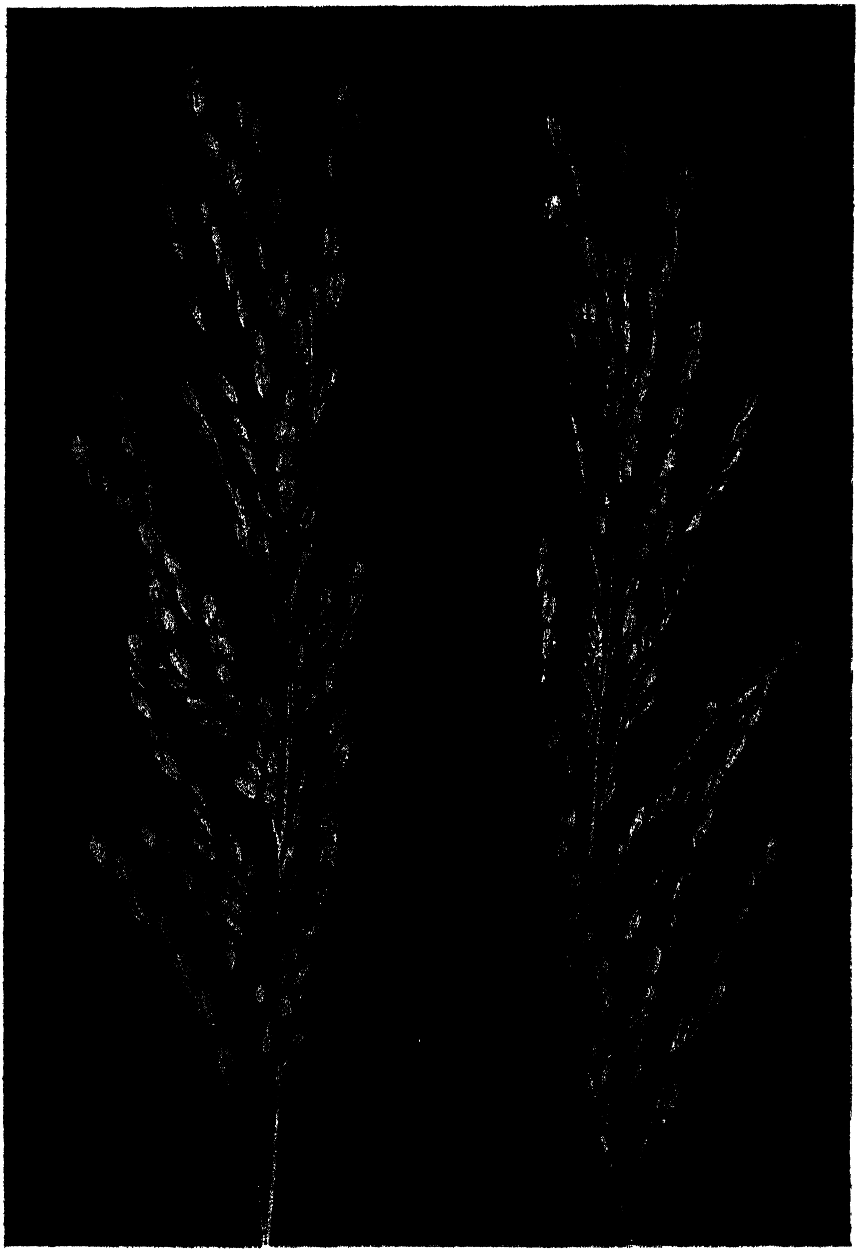
A variety developed in California, from Wataribune, introduced there from Japan. It is erect and vigorous in habit, attaining a height of about 3 feet 6 inches; a fair stooler with strong, fairly coarse stems, generally lighter in colour than the leaves; not apt to lodge. The leaves are dark green, medium in length, narrow, and more or less erect and rigid, forming an acute angle with the stem. The terminal or "boot" leaf is shorter than the others, and its tip usually does not extend beyond the end of the head or panicle.

The heads are well filled, with few empty spikelets, fairly dense, of medium length, curved, having typically nine to twelve nodes, each bearing at least one primary branch, and some of the lower nodes two branches.

Rough, persistent awns are present, but these are not constant, varying in length both on different parts of the one head, and on different heads of the one plant; they are most strongly developed on the terminal grains of each branchlet and towards the tip of the head as a whole. Some grains may be completely awnless, while others on the same head may have awns up to 2 inches in length.

The grain is plump, flinty and bright; it is classified as short, medium round. The two glumes (lemma and palet) forming the husk are convex, but the larger, outer glume (lemma), to which the awn is attached, if present, shows a more or less distinct "shoulder" near the tip, when viewed sideways; both glumes are downy.

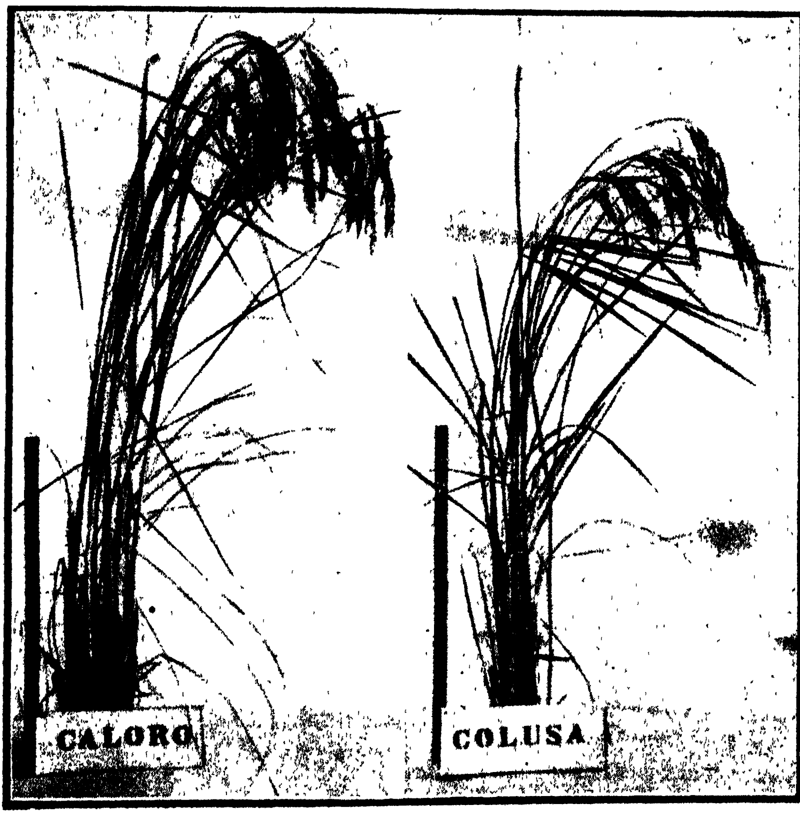
Caloro is the standard variety grown on the Irrigation Area; it is a good yielder, does not shatter easily when ripe, and appears to do well under a wide range of soil conditions. It matures in 180 to 185 days.



Heads of Rice Varieties.
Caloro on the left; and Colusa on the right.

Colusa.

An early maturing variety obtained from California, to which State it was imported from Italy, but probably it originally was Chinese. The growth is erect, but not very vigorous, and rather short, reaching a height of about 3 feet. It is a poor stooler, with weaker stems than Caloro, and is apt to lodge, particularly if allowed to stand for any length of time after ripening. The leaves are dark green, fairly short and narrow, coarse in texture and stiff. Stems are stout and lighter in colour than the leaves at maturity.



Typical Plants of Rice Varieties.

The mature heads are completely awnless, of medium length, curved, with usually eight to eleven nodes. The grain is plump, and, like Caloro, belongs to the short, medium-round class; there is usually a greater proportion of starchy to flinty material in each grain than in Caloro, and the general appearance is more opaque, though still bright. The enclosing glumes are both convex, with an even curve, and they are downy. The heads are well

filled, with few sterile spikelets, but are not very dense and are subject to shattering as they pass maturity.

Colusa is seven to ten days earlier than Caloro. In California it is considered a poor yielder on old land.

Points of Difference.

The chief points of distinction between Caloro and Colusa are:—

Awn.—Caloro always has a variable amount of awn; Colusa is awnless at all stages.

Panicle.—Long and curved in both, but that of Colusa generally has fewer nodes and primary branches.

Unhusked Grain (Paddy).—The "keel" of the Colusa grain is smoothly and evenly rounded, while that of Caloro is generally "shouldered" near the tip.

Kernels.—Colusa is more starchy and opaque than Caloro.

Growing Period.—Caloro 180–185 days; Colusa 175–180 days.

Height.—Caloro is higher than Colusa under the same conditions.

Stooling.—Caloro is a better stooler than Colusa.

Shattering.—Colusa heads shatter more than Caloro if left standing after the crop is ripe.

Lodging.—Colusa has a weaker stem and tends to lodge more readily than Caloro.

Some growers may not concur with the description of Colusa as entirely awnless in view of the fact that much of what is called Colusa on the Irrigation Area is awned, but this latter type usually has the square-tipped lemma in addition to the awn, and closely approximates Early Wataribune in some respects, but is rather variable.

The Improvement of Citrus by Root Stock Selection.

Root stocks have been the subject of investigation by Professor Webber, Director of the Agricultural Experiment Station of the University of California at Riverside. His investigations are fully recorded in Bulletin 317 of the University. He has shown that nursery trees, even when grown from selected buds taken from selected trees, differ greatly in size when they reach transplanting age. His recommendations are:—

(1) Seeds for growing nursery stock must be taken from carefully selected good trees of the kind desired;

(2) When transplanting from the seed-bed to the nursery, all small seedlings (probably 50 per cent. of the total number) should be discarded;

(3) Nurseries should be inspected before budding, and all small and inferior plants cut out;

(4) When budded trees reach the age for transplanting into the orchard only the good, vigorous-growing ones should be used.

From the Report of W. Ranger, Direction of Fruit Marketing, Brisbane.

Farm Forestry.

IV.—The Establishment of Windbreaks, Shelter Belts, and Tree-lots.

[Concluded from page 483.]

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

Thinning.

THE spacing recommended for the original planting has been made close for two reasons; firstly, to ensure the early establishment of a complete overhead canopy of leaves, in order to suppress weed growth and to conserve soil moisture, and secondly, to induce height growth and to prevent undue development of lateral branches. In the majority of cases, however, if all the original trees were allowed to develop indefinitely, they would tend to become drawn out, the girth development would be poor, and the branches would overlap and eventually die, leaving only a few living branches at the top. The result would be a crop of long slender poles, unable to develop into well grown trees. When too crowded, the trees use up all their energy in contending with their neighbours. The crowded crowns are unable to manufacture sufficient food and the roots have difficulty in obtaining water. Under such conditions little growth is made for many years. In the natural or primeval forest such struggle for existence eventually results in the death of a number of the trees, leaving room for the development of the most hardy and vigorous trees. Artificial thinning, however, will accomplish in a short time what it takes nature many years to perform, and hastens the operation of the natural law of the survival of the fittest.

The success of the plantation and the amount of its ultimate yield are frequently dependent on the proper execution of thinning operations. No hard and fast rules can be laid down in regard to these operations, as they vary greatly with different species and local conditions, and it is practically essential to obtain experienced advice from Forestry Officers. The general principles and methods of operation, however, may be briefly stated.

Thinning is not commenced until after the branches of the young trees have developed sufficiently to overlap and to establish a complete canopy of leaves over the whole surface. The first thinning is usually made when the weeds and undergrowth have been suppressed and the lower branches have begun to die. The time taken for this to occur varies with the rate of growth of the species and the locality, but with fast-growing species like the eucalypts, it is generally about four or five years after planting. An examination of the trees on the plantation after this period will reveal that some are already showing signs of suppression by their neighbours, while others are making strong, vigorous growth.

When selecting trees for removal in the thinnings, any badly-formed, diseased, defective or poorly developed trees should be chosen. Those trees that have fallen behind in the struggle for existence should be removed in order to allow further development of the vigorous ones. On no account should any regular system of removal be adopted, such as removing every second or third tree, irrespective of its vigour and general healthiness.

Further thinnings are required from time to time as soon as it is noticed that the crowns are becoming unduly crowded. In most cases the object is to have the crowns of the best trees just about touching. Too heavy thinning is often practised, but should be avoided, as the ground becomes unduly exposed and the redevelopment of laterals is encouraged, thus counteracting the initial advantages of close planting. A number of light thinnings is a much better practice than one or two heavy ones. Any openings made in the canopy should be closed again after three to five years, and the struggle for existence should not be stopped altogether.

The condition of the crown is often a good indication of the need for thinning. Not less than one-third, and often a greater proportion, of the total height of the trees should be occupied by the crown, so that where clean stems are too evident, a thinning is necessary. The process implies a gradual removal of the weaker trees as the best specimens develop. Often the actual final harvest consists of only one-quarter to one-third of the number of the original trees, an original planting of 680 to the acre being reduced to about 200. The thinnings, however, are not without value, and often represent half the value of the crop, depending on the available market for timber of small sizes. On the farm area such thinnings could always be used to advantage for fuel and other purposes. In many cases thinnings will not be carried out to any great extent in the farm tree-lot, as the original spacing will be fairly wide, and as the production of clean, high-grade timber is not so essential for the farmer's requirements. In many plantations of *Pinus insignis* which were originally spaced at 8 feet by 8 feet, no thinnings have been made during the whole life of the plantation. In one case in South Australia such a plantation reached a height of 80 feet in thirty years, with a diameter of 11 inches.

Thinning operations will therefore be limited in some cases to the removal of dead, diseased, or dying trees. Where the spacing of the trees is wide and little thinning is necessary, pruning of the lower branches might be practised with advantage.

Pruning.

Artificial pruning is hardly practicable in a large forest, but can be carried out with advantage in the farm tree-lot where only a small area is concerned. It takes the place of, or supplants, natural pruning, brought about by crowded growth of trees, and its practice renders possible a wider spacing of the trees in the original planting. Such wide spacing means less expense in obtaining stock and planting, more rapid growth, and avoidance of the trouble of thinning operations.

All branches should be cut off smoothly and close to the trunk, avoiding as far as possible any injury to the bark or wood of the latter. Where possible, all wounds should be painted over to prevent infection by fungi or insects. Operations should be carried out when the tree is dormant or making little growth, during winter months. A brush hook may be used for removing the smaller branches, and axes and saws for the larger ones. The branches should be removed in most cases to a height of 20 to 25 feet, the pruning taking place in two or three operations. Pruning is especially desirable with those species like *Pinus insignis,* which do not readily shed their branches. It should be carried out when the trees are quite young,

A Breakwind of Young Kurrajongs.
This species is also the best for planting for fodder purposes

but, unless the trees are widely spaced, not until the lower branches begin to die. In the case of fast-growing species, like *Pinus insignis*, this would be about seven to ten years after planting.

Pruning also helps to reduce fire risk, as the presence of low branches in the plantation might easily convert a ground fire into the more injurious crown fire. In some of the naturally-occurring belts of cypress pine on western holdings, pruning is sometimes practised in order to improve the quality of the timber.

Management.

In the majority of cases the purpose of the farm tree-lot will be to supply the farm with its timber and fuel requirements. These are usually irregular, necessitating the removal of a tree or a number of trees at indefinite intervals. Such a system is usually termed a selection system, implying the selection and removal of certain trees in the plantation, as contrasted with the removal of the whole of the trees in one cut. When any

trees are removed, the open spaces thus created should be filled with new plants as soon as possible, so that the tree-lot is gradually converted into a stand of uneven-aged trees. Such regeneration will often take place naturally, but if conditions are unfavourable for natural regeneration, then planting young stock should be resorted to. In any case, the whole of the tree-lot should be kept well stocked, and no wide gaps allowed to develop. Owing to irregular removal of trees and consequent irregular planting or regeneration, there will always be a certain amount of young growth in evidence, which should be protected from damage by the exclusion of stock.

In selecting trees for cutting, especially for fuel purposes, it is not advisable to cut only the best trees, unless these have reached their optimum development. Selecting the best trees only will lead to a gradual falling off in the standard of the plantation. It is also important to know the number of trees that can be removed each year, so that a continued and regular supply is assured more or less indefinitely. Generally speaking, no more should be taken out than what is equivalent to the amount of growth made each year. This amount varies with the size of the plantation, the rate of growth, local conditions, &c., but it can be gauged by the general condition of the tree-lot. If this is becoming too thin, then cutting should be suspended, or, at any rate, reduced.

Where the tree-lot is of fair size, a convenient way of regulating the annual yield is to divide the total area up into a number of compartments, one of which is cut right over each year. If the area is being worked on a rotation of twenty-five years, for example, (*i.e.*, if the period of growth necessary for the desired development of the trees is twenty-five years), then the area can be divided into twenty-five equal compartments, each of which represents the yield available for one year. As each compartment is replanted or allowed to regenerate naturally after cutting, the first compartment will be ready for re-cutting by the time the last compartment has been used.

When the tree-lot is worked on the selection system, care must be exercised in removing the trees, so as to avoid damage to other trees and young growth. The direction of fall which will cause the least damage should be determined beforehand, and the tree felled in that direction.

Fodder Tree Plantations.

Apart from the growth of trees for timber and fuel, there are several special crops which present opportunities of profit to the landowner.

In the drier parts of the State the establishment of plantations of fodder trees to serve as a standby for drought periods has much to recommend it. Where the number of naturally-occurring fodder trees is fairly large, there will, of course, be no need for such plantings, but on many holdings such trees are too few in number or altogether absent. The district may be naturally poor in such trees, or existing ones have been destroyed by careless lopping or clearing.

The growth of fodder tree plantations is well worth while where pastures are insufficient to carry stock over bad periods. Before initiating such work, however, it is advisable to consider whether the local conditions of soil, rainfall, &c., will permit the growth of the particular tree proposed for planting. In some instances plantations have been started, but have gradually failed and finally been abandoned, because of the poor growth made by the species selected. In many districts, however, good growth can be obtained from many of the most useful species, such as kurrajong.

It is most essential that the land be carefully prepared beforehand, and the methods of planting followed which have been described in a previous article. In localities where the need for fodder plantations is most pressing, conditions are generally fairly difficult for tree-growing, and the trees require every assistance possible. The plants should be spaced more widely apart than those grown in the ordinary farm tree-lot, as a good development of lateral branches is required to assure the maximum growth of foliage. Each tree should, therefore, be given sufficient space to enable it to attain its full development. On the other hand, they should be spaced so that when fully grown they practically touch each other in their widest spread, thus providing as much protection as possible for the soil, and helping to restrict weed growth. Weeds and grasses, however, will make greater development than in ordinary timber plantations, owing to the wider spacing adopted. Cultivation should therefore be carried out at intervals during practically the whole life of the plantation in order to ensure the best results. The spacing varies with the species to be planted, but in most cases a spacing of 20 feet would be found satisfactory.

A Lemon-Scented Gum
(*Eucalyptus citriodora*.)

The choice of a site will depend on soil conditions, &c., but if a water supply is available the site should be placed in a position handy to that supply, so that the young stock can be watered with the least amount of trouble. Sometimes, if the plantation be placed near the homestead, it serves the additional purpose of beautifying the dwellings and affording them a certain amount of protection from wind and dust. Such a scheme has been successfully followed at Mungeribar, on the western line. Protection from stock invasion is, of course, essential. The presence of fodder

trees in any pastoral area is undoubtedly a big asset, and the trouble and expense of starting a small plantation will pay big dividends in many ways.

Wattle Bark.

As the ordinary wattle bark employed for tanning purposes is obtained from species which are native to Australia, it might reasonably be supposed that such growth and production would be carried out largely in Australia. Such, however, is not the case, but wattle bark is grown well and profitably in other parts of the world, notably South Africa. Judging from the large imports of wattle bark into this country, Australia is apparently in the process of becoming dependent on the outside world for the supply of one of its own native products. The main reason, probably, for such a condition, is that too much reliance has been placed on natural growth and insufficient attention paid to replanting, establishing plantations, or even encouraging natural regeneration to take place. In South Africa the industry is on a very firm basis, about 200,000 acres being under cultivation in Natal alone. The success of the industry there has been undoubtedly helped by the abundance of cheap labour and the suitability of the Natal highlands for such work. On the other hand, there does not appear to be any strong reason why the growth of wattle for bark should not be profitable in this State, especially if carried on as an adjunct to other occupations.

In Victoria several plantations have been successfully worked for many years. The market appears to be always assured, and the returns are among the quickest of any forest industry. The trees are fairly easily established, either from young plants, or from the direct sowing of seed on prepared land. It is not proposed to give the details of the methods adopted in wattle cultivation, but merely to draw attention to the possibilities of such work.

Trees Supplying Essential Oils.

The extraction and preparation of oils from the leaves of various eucalyptus species is a well established industry in many parts of the Commonwealth. The source of supply is mainly the naturally occurring material found in the forests, and such resources will be sufficient to meet most demands for many years to come. On the other hand, it would appear necessary to make plantations of some species in the near future, in order to ensure a uniform and continuous supply. This is particularly the case with those species which yield valuable oils, but which do not occur naturally over very large areas. Very little has been done so far in this direction, but there appears to be a fair scope and profit for anyone who is prepared to take up the work.

Eucalyptus Macarthuri and *E. citriodora* are trees the foliage of which yields oils which are in demand for perfumery purposes. *Leptospermum citratum* is a shrub which yields a fine oil and which makes very rapid growth under cultivation. As practically no work has been carried out in forming such plantations, it is impossible to give any definite data about their commercial possibility, but many people in a position to judge

believe that the cultivation of certain species would result in a good profit to the grower. In any case, it is only a matter of time until such plantations must necessarily be established to take the places of exhausted natural resources. These plantations would yield comparatively early returns, and may be cut over many times before the original stock becomes worked out.

Christmas Trees.

In other parts of the world quite profitable little industries exist by the growing of small pines and spruces for Christmas trees. Seedlings are planted out at about 3 to 4 feet apart and are ready for the market when reaching a height of 6 to 8 feet. In addition, a certain amount of demand exists for smaller-sized trees. The time taken for the trees to reach marketable size varies from three to six years. At present nothing is done in this way in New South Wales, but, judging from the large number of requests at the Christmas season for plants or pine branches suitable for transforming into Christmas trees, there should be a good market for trees specially grown for the purpose. The demand, of course, would be necessarily limited, but a market might also be found amongst buyers who wish to plant fairly well-developed ornamental trees in place of the usual small plants.

THE COMPARATIVE COST OF PISÉ BUILDINGS.

OWING to the comparatively high rates of wages which must be paid to builders' labourers in this State, pisé construction has not been adopted by this Department, and only in isolated cases by individual farmers or settlers. Pisé construction differs from any other only as regards the walls. The same amount of timber is required—if anything a little more —for making the moulds or forms as for concrete walls, and the comparison of cost is, therefore, between the cost of the two materials, and the labour of placing them in position.

With cement concrete, a wall 4 inches thick, properly reinforced is sufficient for, say, a cottage, whereas in pisé construction not less than 12 inches could be used. It will be seen then that for every cubic yard of concrete mixed and placed in position three of pisé will be required. This latter material is usually dug out of the ground in close proximity to the building site, but the cost of digging, mixing, and placing, and the extra tamping into position of 3 cubic yards of pisé approximates very closely the cost of 1 cubic yard of concrete. Special care and extra framing are necessary for securing window and door frames, and if these become loose in the completed structure it is difficult to remedy the defect.

Where labour has to be paid for, pisé is not the cheapest form of construction. It does give to a house a more equable temperature, but the numerous advantages of other systems make them more popular.—N. L. JONES, Supervising Architect.

Oat Smuts.

R. J. NOBLE, Ph.D., Biologist.

Two distinct types of oat smut occur in New South Wales—(*a*) loose or open smut, caused by the parasitic fungus *Ustilago avenæ*, and (*b*) covered smut caused by the fungus *Ustilago levis*, It has also been shown that there are distinct strains of each of these parasitic fungi, but both types of disease may be controlled by the same method of seed treatment; hence for all practical purposes the oat smuts may be considered as belonging to one group.

Loose smut is the most common form of the disease under local conditions. The smut destroys the oat grain and the enclosing glumes or chaff and reduces them to a mass of black sooty powder. The black sooty particles are the spores of the fungus and they serve to carry the disease over from season to season. The heads or panicles are reduced in size and are somewhat erect in contrast to normal healthy panicles. The smut may also sometimes develop in the uppermost leaf of affected plants. Later in the season the spores are blown away by the wind, leaving only bare stalks on the panicle. (Fig. 1).

Covered smut differs from the former mainly in that it does not cause such extensive destruction of the glumes or chaff. The glumes are only partially destroyed, and the spore masses of this fungus are not so readily broken up and scattered by the wind. (Fig. 2).

The life history of the oat smuts is in many respects similar to that of bunt or ball smut in wheat.

The smut spores, on being dislodged by the wind or by harvesting operations, may be carried on to healthy grains and become lodged in the crevices of the grain, or may merely rest on the surface of the grain. In some cases the spores may germinate and produce a resting mycelium or fungus thread inside the enclosing glume of the oat grain. Generally, however, development of the spore is delayed until the grain is sown, and by germinating simultaneously with oat grain, the fungus is able to penetrate the first shoot of the oat plant and thus become established in the plant. These infected plants show no signs of disease until heading time, when the fungus reproduces itself at the expense of the developing grain in the manner described above.

Control Measures.

If oats are sown early in a dry seed-bed, there may be sufficient moisture to germinate the oat smut spores before the oat grains germinate. The oat smut fungus may then be destroyed before germination of the grain and a clean crop may result. If oats are grown merely for feeding off there is no necessity to treat the grain, since grain is not allowed to be produced. But

if the seed has been obtained from a diseased crop and if there is any possibility that hay or grain will be required, the seed should be treated before sowing.

With the exception of the Skinless type, the oat varieties under cultivation produce grain which is enclosed in hulls or chaff. Most of our commercial varieties belong to the latter group. The structure of the grain does not

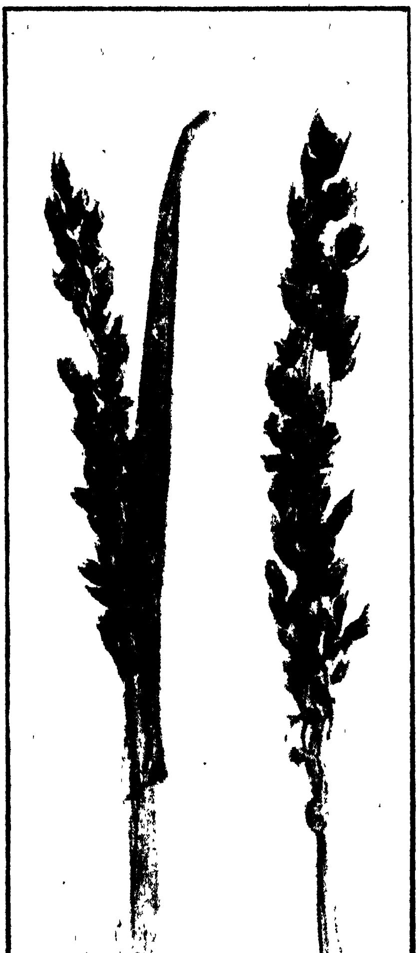


Fig. 1.—Loose Smut of Oats.

Fig. 2.—Covered Smut of Oats.

permit satisfactory penetration by fungicidal dusts at present in use, hence treatment with copper carbonate dust is not as effective as it is in the control of bunt in wheat. It is preferable, however, to treat with copper carbonate dust if the alternative is to be no treatment.

Oat smuts can be most effectively controlled by the use of formalin, but unless precautions are taken some seed injury may result. The procedure is as follows :—

Place the grain on a tarpaulin or on a clean floor, and while shovelling sprinkle with formalin (1 lb. formalin to 40 gallons water) until the grain is uniformly but not excessively moistened.

A little less than a gallon of solution will be required per bushel of seed. The grain should then be covered for four to five hours with wet bags or canvas to retain the gas. If the right amount of solution has been added, the grain will absorb the moisture, and though swollen should run freely through the drill.

The grain should be bagged in clean bags to prevent re-infection, and sown as soon as possible after treatment.

The grain may also be dipped in formalin solution and covered with bags as described above, but in this case it is difficult to dry the grain sufficiently prior to planting.

Treatment with copper carbonate dust at the rate of 2 to 3 oz. per bushel is satisfactory only when seed has been obtained from lightly diseased crops.

"Report of the Imperial Agricultural Research Conference."

The report of the Imperial Agricultural Research Conference, held in Great Britain in October and November, 1927, which was attended by delegates of high standing from all countries in the Empire, has now been issued. It contains a full account of the events leading up to the conference, the recommendations made (both in full and in summary form), and the views expressed by the highest authorities in agriculture in all quarters of the Empire.

Three important schemes are recommended in the report—first, the setting up throughout the Empire of a "chain" of agricultural research stations; second, the setting up in the United Kingdom of clearing houses of information in agricultural science which shall serve the whole Empire; and third, the recruitment, training and interchange of scientific workers in agriculture for the whole Empire.

The Conference had no fewer than eleven Specialist Committees, one each for veterinary science, animal nutrition, animal genetics, dairying, soils and fertilisers, plant breeding, plant pathology, fruit, entomology, preservation and transport, and agricultural economics, and many important recommendation relate to these special subjects.

The report consists of 250 pages and is issued by H.M. Stationery Office, London, at the specially low price of 1s. (with postage 1s 5d.) in order that it may be within easy reach of all those affected. A number of agents throughout the Empire have undertaken the sale of the report, Messrs. Gordon and Gotch, Sydney, being the local distributors.

Our copy from the publishers.

Farm Measurements.

W. McCARROL, Lecturer in Surveying and Farm Accounts, Hawkesbury Agricultural College.

THE common problems of farm measurements can be dealt with by simple rules of mensuration. There is usually no need to aim at exact measurements, since only a reasonable approximation is generally desired, especially in valuation work, where many factors besides measurement must be considered, the final result being at best only an estimate, depending on the skill and experience of the valuer.

In finding areas we must know how to—

(1) Run straight lines,

(2) Measure distances,

(3) Set out a line at right angles to another line.

There are important points to be noted in doing these simple jobs.

In sighting a straight line the poles must be straight, and must stand straight up out of the ground. Any third pole may be placed in line with two others by sighting over the tops or along the sides of the first two.

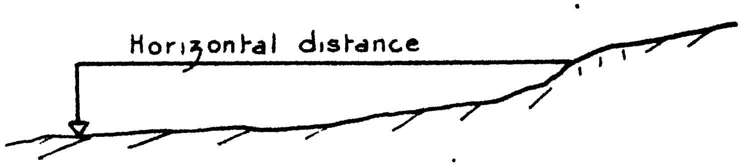


Fig. 1.

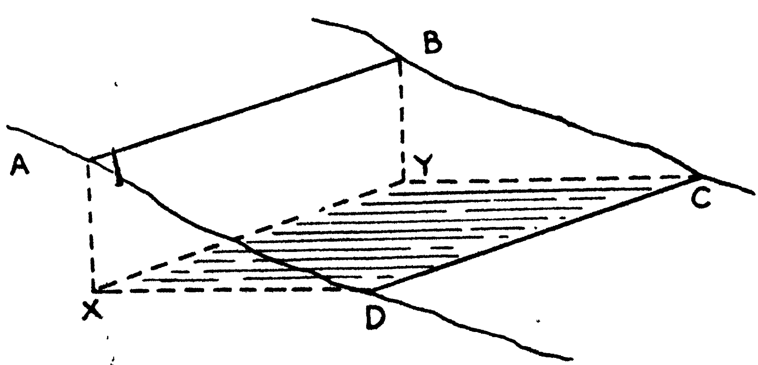


Fig. 2.

All distances must be measured horizontally, that is, on the level. When ground is sloping or bumpy, one end or, if necessary, both ends of the tape, must be held off the ground. The point on the ground which coincides with

the raised end of the tape is easily found by dropping a small plumb-bob—a small stone or an old nut on the end of a piece of string is accurate enough for most practical purposes. (*See* Fig. 1.)

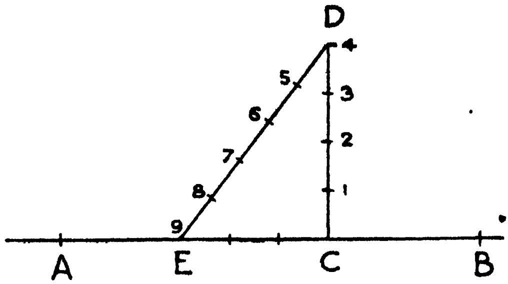


Fig. 3.

The reason why horizontal measurements are always taken in finding land areas becomes obvious when we realise that in general no more trees or blades of grass will grow on the side of a hill than on the horizontal area of the same piece of ground. If ABCD (Fig. 2) is a paddock on the side of a hill, we calculate actually the area XYDC, which is the "effective area," obtained when horizontal measurements are used in the calculation.

Where it is desired to mark a spot, it is advisable to drive a small peg flush with the ground, and to mark its position by means of a longer peg or pole projecting well up out of the ground.

To Set Out a Right Angle.

The common method of setting out a right angle is the "3–4–5 method," which depends upon the fact that any triangle of which the sides are in the ratio of 3–4–5, has a right angle at the junction of the two smallest sides.

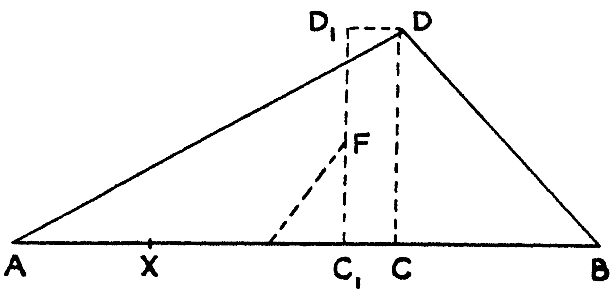


Fig. 4.

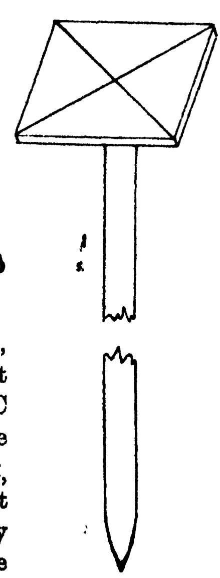


Fig. 5.

Suppose AB in Fig. 3 is a given line—a line of fence, for instance—and it is desired to lay out a line at right angles to it, from a point C. Measure 3 yards, from C to E. Hold or secure the end of the tape at C, and the 9-yards mark at E. Then, holding the 4-yards mark, draw the tape taut throughout its whole length, and put n a peg at the 4-yards mark, *i.e.*, at the point D. By sighting over poles placed at C and D the desired line may be produced to any length.

A handy method of securing the tape on a peg when there is no one to hold it, is to drive a nail in the top of the peg, and then the link at the end of the tape may be thrown over this, or the tape may be wrapped round it.

A second method is to hold the end of the tape first on C, and with a sharp stick held at the 4-yards mark, draw an arc on the ground where the point D is expected to be. Next hold the end of the tape at E, and as before, but holding the sharp stick at the 5-yards mark, draw a second arc to cut the first arc. The point where these two arcs or lines cross, will give the required point D.

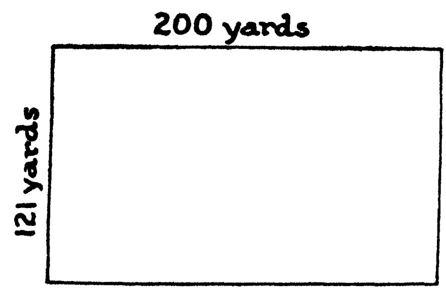


Fig. 6.

Any multiples of 3, 4 and 5 may be taken, *e.g.* 15, 20 and 25 or 30, 40 and 50. The longer the sides taken, the greater will be the accuracy.

A common problem in finding areas, is to have to make the new line pass through a point (D in Fig. 4) some distance from a line, and at the same time make it at right angles to the line (AB in Fig. 4). If AB is not a fenced line, then sight from A to B, and place a pole at any point X in the line AB. By aligning with the poles at A and X, it is possible to keep on the line AB.

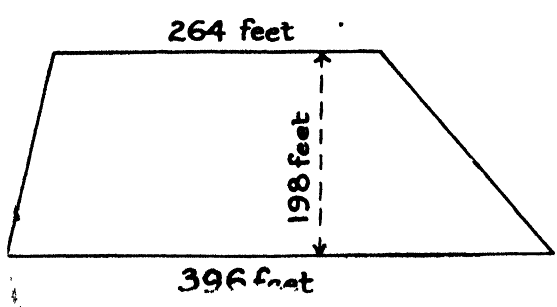


Fig. 7.

The point C_1 might be guessed with the eye with sufficient accuracy for some jobs, but for greater accuracy, it should in addition be checked by erecting a line C_1F at right angles at C_1. By sighting over C_1F, the error DD_1 can be noted with the eye, and the point C_1 moved along this distance to C. Another checking may or may not be necessary.

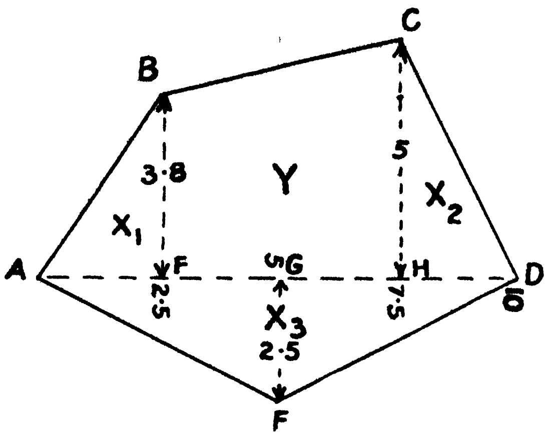


Fig. 8.

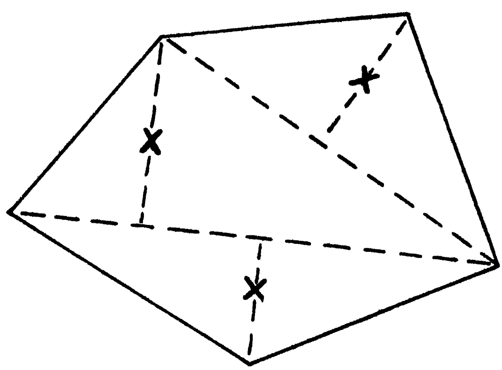


Fig. 9.

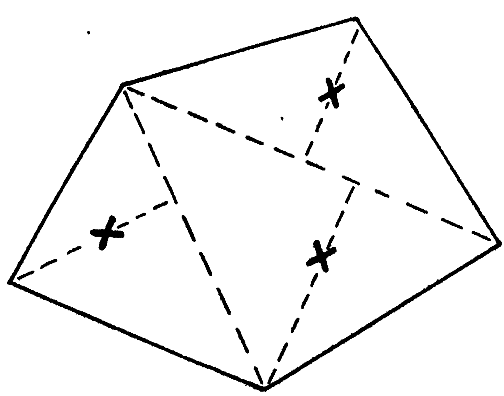


Fig. 10.

A simple and useful little instrument for setting out right angles, can be made as follows:—Take a piece of well-seasoned board about 6 inches square and 1 inch thick, and saw two clean cuts across the surface, about ½ inch deep, and exactly at right angles. Attach this board to a stake 3 to 4 feet long, pointed at one end. This is best done by means of a screw countersunk into the centre of the cross so that the line of sight will not be obstructed. The screw should be just firm enough to allow the cross staff to be turned into any line. If required, the cross-head may be taken off the stake and placed on a post in a line already fenced. (*See* Fig. 5).

Applying this instrument to the problem illustrated in Fig. 4, we would place it at C_1 in the line AB, and turn it round until, by sighting through one of the cuts, it is seen to be in line with AB. Then, by sighting through the other cut, a line is got at right angles to the first. By moving the cross-staff one way or the other, the desired point C is quickly obtained.

Measurements will usually be taken with the common linen tape, in feet. Measurements in chains and links offer easier working of these problems, because links may be so easily expressed as a decimal of a chain, *e.g.*, 10 chains 75 links=10·75 chains.

The area will be square feet, square yards, or square chains, according as the figures multiplied together represent feet, yards, or chains. There are :—

9 square feet in 1 square yard.
4840 square yards in 1 acre.
10 square chains in 1 acre.

To obtain acres :—

If the answer be in square chains, divide by 10.
" " yards, " 4840.
" " feet, " 4840×9.

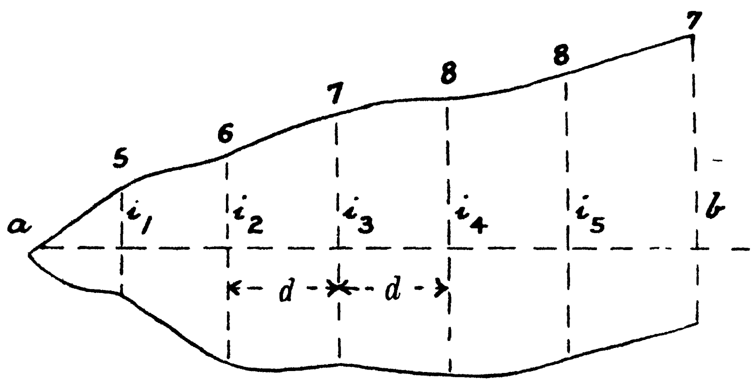


Fig 11.

In finding areas the shape of the paddock is a first consideration. Where the field is four-sided and all corners are right angles, the area is found by multiplying the length by the breadth. In this case the opposite sides are parallel and equal. For example, Fig. 6 represents such a field, 200 yards long by 121 yards wide. The area $= 200 \times 121$ square yards $= \dfrac{200 \times 121}{4840} = 5$ acres.

If a four-sided paddock has only two sides parallel (they may or may not be equal), it is called a trapezoid or trapezium. Its area is found by multiplying the sum of the parallel sides by the perpendicular distance between them, and dividing the result by 2. Fig. 7 is an example. Its area $= \dfrac{(396 + 264) \times 198}{2}$ square feet $= \dfrac{660 \times 198}{2 \times 9 \times 4840}$ acres $= 1\frac{1}{2}$ acres.

In the case of paddocks having four sides, none of which is parallel, or having more than four sides, it is necessary first to divide them into triangles or trapezoids. The area of each triangle or trapezoid is then

calculated, and the areas of all these sub-divisions added together to get the total area. Figs. 8, 9, and 10, show the same field divided up for purposes of determining the area. In Fig. 8 the areas X_1, X_2, X_3 are triangles, X_1 and X_2 being right-angled triangles, and Y is a trapezoid. In each of the figures 9 and 10, there are only three triangles marked X; but in order to complete the area in these cases, five measurements must be taken as against four in Fig 8. Since the field measurements take much longer than the actual calculations, the method of division illustrated in Fig. 8 is to be preferred.

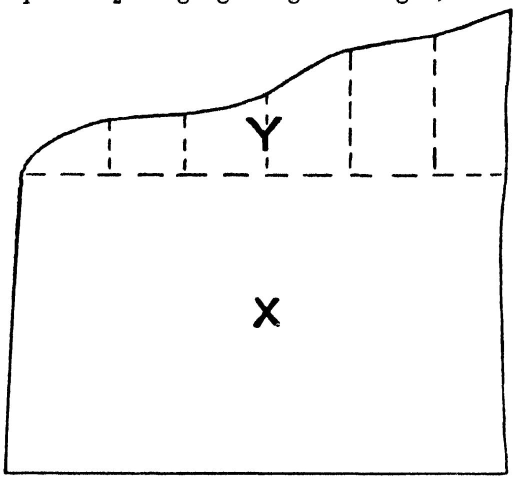


Fig. 12.

The area of any triangle is found by multiplying the base by the perpendicular distance from the base to the opposite angle, and dividing by 2. The area of a right-angle triangle is found by multiplying together the two shorter sides (*i.e.*, the base by the perpendicular height), and dividing by 2. In Fig. 8, let AD = 10 chains; AF = 2·5 chains; HD = 2·5 chains; BF = 3·8 chains; CH = 5 chains; and GE = 2·5 chains.

Then, area of triangle $X_1 = \dfrac{2{\cdot}5 \times 3{\cdot}8}{2} = 4{\cdot}75$ square chains $= {\cdot}475$ acre.

The area of triangle $X_2 = \dfrac{2{\cdot}5 \times 5}{2} = 6{\cdot}25$ square chains $= {\cdot}625$ acre.

The area of triangle $X_3 = \dfrac{10 \times 2{\cdot}5}{2} = 12{\cdot}5$ square chains $= 1{\cdot}25$ acres.

The area of trapezoid $Y = \dfrac{5 + 3{\cdot}8 \times 5}{2} = 22$ square chains $= 2{\cdot}2$ acres.

The total area of the field ABCDE is thus :

$${\cdot}475 + {\cdot}625 + 1{\cdot}25 + 2{\cdot}2 = 4{\cdot}55 \text{ acres} = 4\tfrac{1}{2} \text{ acres approximately.}$$

In the above examples, the perpendicular heights would be easily found with the aid of the cross-staff (Fig. 5), as illustrated in Fig. 4.

For areas bounded by curves, the trapezoidal formula may be used. This formula is, " Add together the intermediate offsets and half the end offsets, and multiply the sum by the constant interval." To apply this to Fig. 11, the field is actually divided into a number of trapezoids having the same perpendicular distance *d* between them. The formula assumes that the

parts of the curve bounded by the offsets are straight lines. The end offsets are represented by a and b, the intermediate offsets by i, and the common interval between the offsets by d.

$$\text{The area thus equals } d \left\{ \frac{(a+b)}{2} + i_1 + i_2 + i_3 \text{ etc.} \right\}$$

The offsets i, would be measured at constant intervals of 1 or 2 chains, at right angles to the main dotted line (base line) running through the paddock. In the above case, the end offsets, a and $b = 0$ and 7 respectively, d the common interval = 2 chains; intermediate offsets = 5, 6, 7, 8, and 8 chains.

$$\text{The area} = 2 \left\{ \frac{(0+7)}{2} + 5 + 6 + 7 + 8 + 8 \right\} \text{ square chains;}$$

$= 2(3\frac{1}{2} + 34)$ square chains; $= 75$ square chains; $= 7{\cdot}5$ acres.

This formula is readily applied to areas bounded by creeks or rivers (see Fig. 12). The dotted line shows method of division. The portion X forms a rectangle. The area of the irregular portion Y can be determined by the trapezoidal formula.

Fig. 13 illustrates a method that may be used in some cases for irregular areas. A regular figure—triangle, square, or rectangle, is constructed around the figure, and its area determined. The excess area is then obtained by calculating separately and adding together, the areas of the outside figures. The area of the irregular block illustrated in Fig. 13 would be the area of the main rectangle, ABCD, minus the sum of all the figures marked X.

The area of the main rectangle ABCD $= 14 \times 12 = 168{\cdot}00$ square chains.

$$\text{The area of } X_1 = \frac{2 \times 7{\cdot}8}{2} = 7{\cdot}80 \text{ square chains;}$$

$$\text{The area of } X_2 = \frac{5{\cdot}6 \times 1{\cdot}2}{2} = 3{\cdot}36 \text{ square chains;}$$

$$\text{The area of } X_3 = \frac{(5{\cdot}6 + 5) \times 3}{2} = 15{\cdot}90 \text{ square chains;}$$

$$\text{The area of } X_4 = \frac{(9 + {\cdot}6) \times 3}{2} = 14{\cdot}40 \text{ square chains;}$$

$$\text{The area of } X_5 = \frac{{\cdot}6 \times 4}{2} = 1{\cdot}20 \text{ square chains;}$$

$$\text{The area of } X_6 = \frac{5 \times 2{\cdot}5}{2} = 6{\cdot}25 \text{ square chains.}$$

The total area of the areas marked X = 48·91 square chains.

The area of irregular field thus = 168 — 48·91 = 119·09 square chains; = 11 acres 3 roods 25·4 square poles.

It will be seen that two small areas, *y* and *z*, cancel each other. It saves much time in measurement and calculation to run straight lines along the irregular curves so as to arrange this " give and take " of small areas. Unless great precision is required, this procedure is quite permissible, any resulting error being generally negligible in practice.

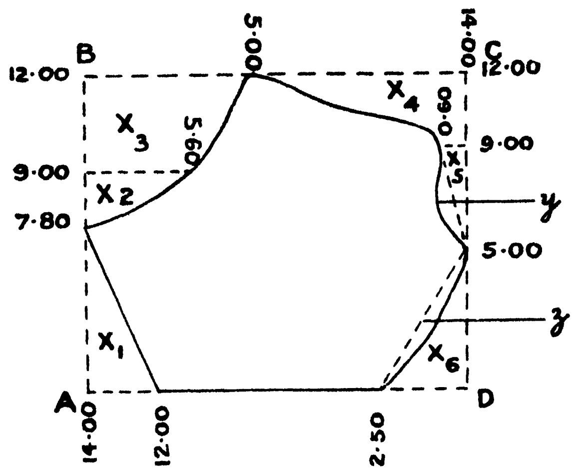


Fig. 13.

A possible internal division of the area shown in Fig. 13 is given in Fig. 14. Generally it will be found easier to make internal divisons. Irregular areas call for the application of common sense rather than fixed rules in making subdivisions to get the least number of regular figures, from which the area required is easily found.

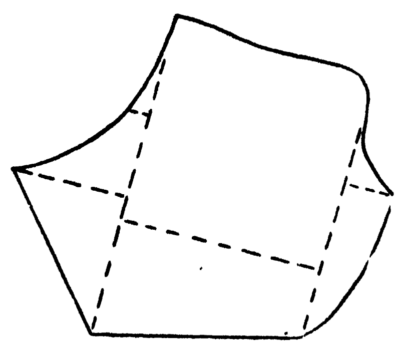


Fig. 14.

Some definite system should be followed in taking notes in the field. Perhaps the best way is to make a neat, rough sketch of the field, showing the actual field boundaries as full lines, and the imaginary lines of sub-division as dotted lines. Write in the figures always at right angles to the direction of measurement. This latter instruction is important and will prevent confusion, as experience will show. However, in some cases—long diagonals for instance—where confusion is not likely to result, the figures may be writtten on the line. (*See* Fig. 13.)

Infectious Diseases Reported in May.

The following outbreaks of the more important infectious diseases were reported during the month of May, 1928:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	10
Piroplasmosis (tick fever)	Nil.
Blackleg	2
Swine fever	2

—Max Henry, Chief Veterinary Surgeon.

Feeding Tests With Mexican Poppy and Stinkwort.

H. R. SEDDON, D.V.Sc., and H. R. CARNE, B.V.Sc.

MEXICAN POPPY (*Argemone mexicana*).

THIS weed, troublesome in some parts of the State, is considered by some to be harmful to stock.

Maiden (*Weeds of New South Wales*, page 51) figures it and discusses the question as to whether it is harmful or not. He quotes one stockowner as stating that sheep do not, and would not when specially fed, eat the plant. The same owner, however, is stated to have seen symptoms of violent colic in horses fed chaff containing the weed.

Mr. Stock Inspector Gavel, of Dubbo, in a report states that he has never seen any animal eat the plant, but one owner had reported to him that he saw sheep eating the seed pods. Through the courtesy of Mr. Gavel, a quantity of seed and, later, supplies of the fresh plant were forwarded for testing.

Experiments with Seed.

Experiment 1.—Sheep drenched with seeds from fifteen black pods (seeds ripe but not hard) and nine green pods (seeds immature) ground and suspended in water. Result: Remained normal.

Experiment 2.—Guinea-pig drenched with aqueous extract from 2 grammes mature seeds macerated in water for twenty-four hours. Result: Remained normal.

Experiment 3.—Guinea-pig inoculated subcutaneously with aqueous extract from one gramme ripe seed ground to powder. Result: No general symptoms. Inflammatory swelling at site of inoculation.

Experiment 4.—Rabbit drenched with aqueous emulsion of 2.5 grammes ripe seeds (ground up). Result: Remained normal.

Experiment 5.—A Merino weaner lamb was drenched with 50 grammes, and then five days later with 100 grammes of ground seed which had been soaked in water overnight. The whole of the seed (perisperm included) was drenched. Result: Remained normal.

Experiments with Green Plant.

Supplies of fresh plant were forwarded from Dubbo every second day from 25th November to 5th December, 1925. The plant had flowered, and was bearing fruiting pods; the majority of these being young and green, but some almost fully ripe. The whole plant was covered with sharp prickles

which were so severe as to make gloves necessary for handling. The following experiments to determine the toxicity of this plant in the green state for sheep were carried out:—

Experiment 6.—Two sheep were offered leaves of the plant which had been chaffed after removing the fruiting heads and woody butts of the stems. These leaves were mixed with an equal quantity of oaten chaff and the animals were allowed water *ad libitum.* The plant appeared to be very distasteful to the sheep, probably on account of the prickles, and none was eaten during the first forty-eight hours. Feeding with leaves was continued over a period of thirteen days, during which the two sheep consumed between them a total quantity of approximately 8 lb. of leaves at the rate of 0.3 lb. per sheep per diem. As the leaves became dried up they were replaced by fresh supplies, so that the sheep had fresh plant continually before them. Both animals became tucked up after the third day of the experiment, and on the fourth day some degree of constipation was exhibited. On the eighth day the faeces were considerably softer than normal though not diarrhoeic. The abstention from the accustomed quantity of food could explain the slight departure from normal noted in these animals during the experiment.

Experiment 7.—A sheep was offered the fruiting heads, which had been through a sausage machine and then mixed with an equal quantity of oaten chaff. This appeared to be very unpalatable to the animal, which refused to touch it until it had been without food for forty-eight hours, and then only a very small quantity was consumed. The experiment was continued for nine days, during which time the sheep consumed only 1 lb. (approximately) of the heads. This sheep only consumed about 2 lb. of food during the whole experiment, and consequently became very tucked up and lost a considerable amount of condition. The faeces were a little softer than normal on the fifth day, but regained their normal consistency the following day. Result: No ill effects which could be attributed to ingestion of heads.

Experiment 8.—Two pounds of leaves from which the butts of the stems and the fruiting heads had been removed were chaffed and minced. These were then soaked overnight in 1,000 c.c. of water. The following morning these soaked leaves were put into a press and 900 c.c. of aqueous "extract" expressed. This "extract" was then drenched to a sheep which had been starved for fifteen hours previously. Result: This sheep showed no departure from normal health.

Experiment 9.—Two pounds of minced green fruiting heads were soaked overnight in 1,200 c.c. of water, and on expression next morning 1,100 c.c. of "extract" were obtained. A sheep was drenched with this "extract," the animal having previously been starved overnight (for fifteen hours). Result: This sheep remained normal.

Conclusion.

On account of the exceedingly sharp spines which cover both leaves and fruiting heads of this plant, it seems unlikely that sheep would attempt to eat it, except perhaps when plants are very young and succulent, prior to the hardening of the spines.

It may be considered that in the above experiments the sheep did not consume a sufficient quantity of the plant to receive a toxic dose of any harmful principle which might be contained therein. This suggestion is not supported by the negative results obtained when sheep were drenched with extracts in which relatively large quantities of the plant were employed.

From the foregoing experiments the following conclusions may be drawn:—

1. That both green leaves and fruiting heads of *Argemone mexicana* are very unpalatable to sheep, probably on account of the sharp spines borne by the plant.
2. Sheep have consumed 4 lb. of green leaves over a period of twelve days and have shown no departure from the normal attributable to ingestion of the plant.
3. A sheep consumed 1 lb. of green fruiting heads during eight days, and remained normal except for loss of condition due to abstinence from food.
4. Sheep drenched with crude aqueous extracts of green leaves and fruiting heads remained normal.

Thus it appears that well grown *Argemone mexicana* does not possess any appreciable toxic effect for sheep, although undoubtedly it is very unpalatable.

STINKWORT (*Inula graveolens*).

The question of the harmfulness or otherwise of this plant is a matter of some debate amongst stockowners in districts where it is prevalent, and as an opportunity was presented the following feeding tests were undertaken:—

State of Plant.—The plant was found to be growing in a locality a few miles from the Veterinary Research Station, and it was thus possible to ensure it being fed in the fresh state. As it was tested in the months of April and May it was necessary to gather it only three times a week to ensure this.

When the first specimens were collected the plant was quite green and showed many immature flower buds. About a week later the plant was in full flower, and towards the end of the experiment the pappus heads had matured and dropped off, the whole plant being much dried up.

Animals Used and Details of Feeding Experiment 1.—Two yearling crossbred lambs were penned and offered the entire plant (except the roots) chopped up and mixed with one-third of its weight of oaten chaff. For the first few days the sheep ate only a small quantity of the weed, but by the end of the first week they were eating fairly well. From the twenty-first day of the test the chaffed weed was offered alone and was eaten quite readily. The feeding was discontinud after the fortieth day.

During the period in question a total quantity of 57.5 lb. was eaten by the two sheep, *i.e.*, 28.7 lb. per animal, this quantity being consumed at the rate of approximately ⅓ lb. per sheep for the first three weeks and thereafter at the rate of 1.½ lb. per day.

Neither animal showed any departure from normal health except that on the fifteenth day some of the faeces in the pen were noted to be rather pultaceous; this condition disappeared a day or two later. It should be noted that the attendant who gathered and cut up the weed suffered some slight transient irritation of the skin of the face and arms when so employed.

Experiment 2.—Three pounds of the freshly-gathered green weed was passed through a small chaffcutter, then minced and soaked in 650 c.c. water overnight. Next day the fluid from this was collected by expression, 700 c.c. being obtained. This was drenched to a yearling lamb which showed no ill effects.

Experiment 3.—At times vegetable material resembling pappus hairs from Stinkwort have been observed in the gastro-intestinal mucosa of sheep that have had access to the weed, and as these are beset with sharp barbs on each side along the whole length it was decided to test these for the presence of any irritant substance.

A number of pappus heads were therefore finely ground in a mortar, and then rubbed up with a little distilled water and allowed to stand in the ice-chest overnight. Next morning this material was filtered and 1 c.c. of the filtrate injected into a guinea-pig subcutaneously. Following this, however, no local reaction was manifested.

Conclusion.—It will be seen from the above that we have not been able to detect anything in the way of poisonous properties in this weed.

NOTE.—A botanical description of this weed appears in Maiden's "Weeds of New South Wales" page 88, and it is illustrated there, and also in Weed Leaflet No. 21 issued by the Department of Agriculture. The question of its destruction is also dealt with in the latter publication.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.	Date.	
Wentworth (W. B. Crang)	July	10, 11
Narrandera Sheep Show ..	,,	17, 18
Forbes Sheep Show (K. O. Anderson).	,,	17, 18
Peak Hill (T. Jackson)	,,	24, 25
Tullamore (A. N. Cornett)	Aug.	1, 2
Trundle (W. P. Forrest)	,,	7, 8
Cootamundra Sheep Show (R. D. Beaver).	,,	8, 9
Condobolin (J. M. Cooney)	,,	14, 15
Gilgandra (G. Christie)	,,	14, 15
Illabo (R. Day)	,,	15
Cargellico	,,	21, 22
Wagga Wagga (F. H. Croaker)	,,	21, 22, 23
Bogan Gate (J. Egan)	,,	22
Ungarie	,,	28
Grenfell	,,	28, 29
Parkes (L. S. Seaborn)	,,	28, 29
Junee (G. W. Scrivener)	,,	28, 29
Forbes (K. O. Anderson)	Sept.	4, 5
Corowa (H. G. Norton)	,,	4, 5
West Wyalong (A. Andrew)	,,	4, 5
Young (T. A. Tester)	,,	5, 6
Holbrook	Sept.	6, 7
Cowra (E. P. Todhunter)	,,	11, 12
Ganmain (C. C. Henderson)	,,	11, 12
Albury	,,	11, 12, 13
Barmedman (S. S. Pembethy)	,,	12
Canowindra (W. E. Frost)	,,	18, 19
Murrumburrah (W. Worner)	,,	18, 19
Temora (A. D. Ness)	,,	18, 19, 20
Boorowa (W. Thompson)	,,	20, 21
Melbourne Royal	,,	20 to 29
Barellan	,,	26
Singleton	,,	26 to 28
Hillston (S. Peevers)	,,	28
Ardlethan	Oct.	3
Quandialla (V. Talbot)	,,	3
Walbundrie (H. G. Collins)	,,	3
Narrandera (J. D. Newth)	,,	9, 10
Ariah Park (Mort Collings)	,,	10
Bribaree (Jesse Austin)	,,	10
Griffith (W. Sellin)	,,	16, 17
Deniliquin (P. Fagan)	,,	16, 17
Cootamundra (R. D. Beaver)	,,	23, 24

Wood Boring Beetles.

THEIR HABITS AND CONTROL.

WM. B. GURNEY, B.Sc., F.E.S., Entomologist, and T. McCARTHY, Senior Assistant Entomologist.

IN New South Wales two types of borers are principally concerned in the attack of seasoned timber used for buildings or furniture, viz., the powder-post beetle (*Lyctus brunneus*) and the furniture beetle (*Anobium punctatum*). For the convenience of those interested in the depredations of these pests this brief note on the structure, habits, and methods of control is published. Reference is also made to the unnecessary anxiety aroused through confusing the damage due to shot-hole or pin-hole borer—beetles of the families *Scolytidae* and *Platypodidae*—with that of the furniture or powder-post beetle.

Life Histories of Powder-post and Furniture Beetles.

The life history of each species is approximately the same in the essential features of their development. Thus the adult beetles emerge generally in mid-summer from October to January, the male and female beetles mate, and a few days later the females commence to lay their eggs. The minute eggs are laid in pores, small crevices or cracks, or in the rough cut ends of the timber, or even in the holes and tunnels previously made by the beetles. The egg hatches into an extremely small grub which bores into the timber and begins its destructive work, extending over ten to twelve months and even longer before the fully grown boring grub changes to the pupal stage. On account of the small size of the eggs and the newly hatched grubs, the eggs are rarely seen, and there is no visible sign of where recently hatched grubs have entered the timber. The timber may, therefore, become infested with hundreds of grubs, which are at work tunnelling inside without there being any external appearance of the infestation until the first of the adult beetles emerges some ten or twelve months later. When fully grown the grub changes, within its tunnel, to the pupal stage. It remains as a quiescent pupa for about three weeks, and then changes to the adult beetle. The adult beetle then emerges from the wood, eating out a small circular hole for exit, and where numbers are emerging the characteristic "pin-holes," as they are referred to, become apparent. These holes and the exudation of powder are the first indications that the timber is infested.

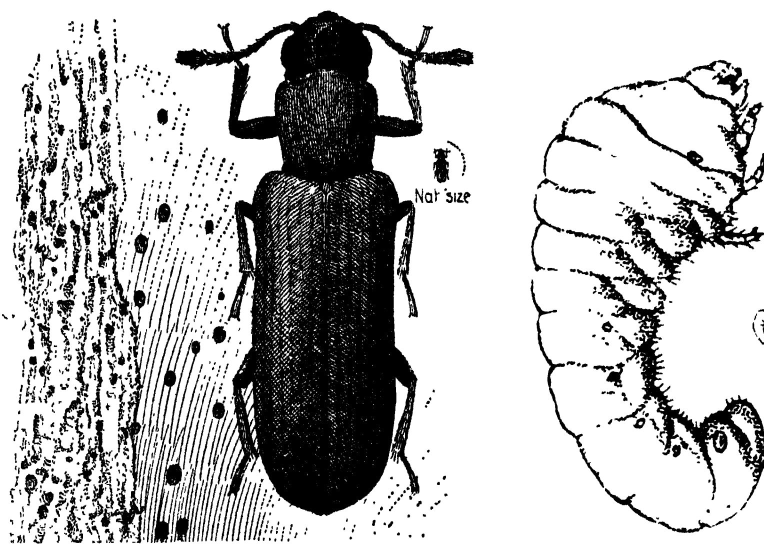
Some differences in the appearance and behaviour of the powder-post beetle and the furniture beetle are indicated below.

The Powder-post Beetle.

These small, narrow-bodied beetles are about one-eighth to one-fifth of an inch in length, and, therefore, show a considerable difference of size among individuals. They are dark-brown to reddish-brown in colour. The feet are 5-jointed, the first one being very small. The antennae are slightly

clubbed at the tip, the two terminal joints being longer and thicker than the others. The head is only partially covered by the front margin of the prothorax (the next segment behind the head). The wing covers are lightly grooved or striated and show minute pits.

The larva or grub is the stage during which the boring and destruction of the timber are carried out. The grub is small, soft and fleshy, and white to yellowish-white in colour. The fore part (thorax) is thicker than the hind body, and the small head is sunken in the thorax, but carries two minute 4-jointed antennae. There are nine pairs of breathing pores (spiracles). The front legs are thicker than the other two pairs.



The Powder-post Beetle (*Lyctus brunneus*).
On the left some damaged woodwork and the adult beetle On the right the larva [*After Dr G. H. Gahan.*]

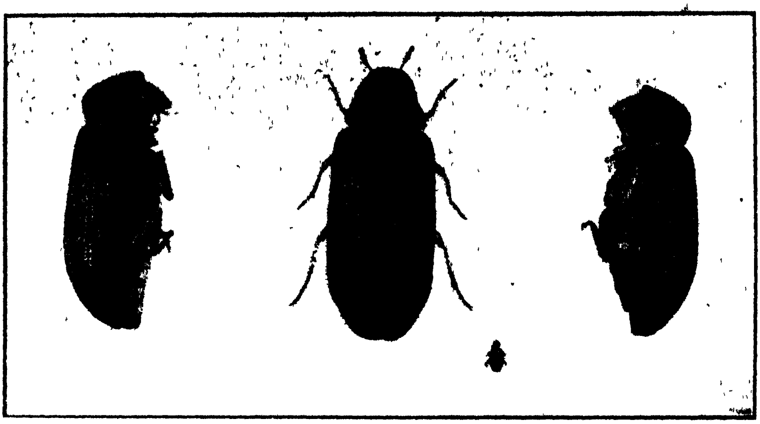
The damage by the larvae of the powder-post beetle occurs mainly in hardwoods and some brushwoods, and is invariably confined to the sapwood of the timbers attacked. The tunnels made, run more or less parallel to the grain of the wood and the powdery excrement behind the advancing grubs is packed tightly in the tunnels. The grains of this powdery matter are finer, or, in other words, it is not such a coarse powder as that produced by the grubs of the furniture beetle.

The Furniture Beetle.

This beetle confines its attack chiefly to white pine timbers, and is never found in our local hardwoods. It is, therefore, most usually met with in pine shelving, pine flooring, and in kitchen and other furniture, or in the backs of more costly furniture where pine is used. It will also attack furniture and pianos constructed of other and harder timber.

The adult furniture beetle is of a dark-brown colour, slightly tinted by the presence of extremely minute greyish hairs, and varies in length from

one-tenth to one-fifth of an inch. The feet are 5-jointed, and the antennae 11-jointed, with the terminal three joints thicker. The prothorax is wide, and overlaps the head like a hood, so that little, if any, of the head is visible from above. The wing covers are marked by fine longitudinal grooves or striae in which are small pits. The adults frequently sham death. The eggs are very minute, oval, and white in colour. The larva or grub is white, the head small, with a pair of minute 2-jointed antennae, the thoracic segments thicker and broader than the other body segments, with three pairs of small 5-jointed legs of small size. A double row of tiny brown spines are present on the upper surface of the third thoracic and seven abdominal segments, and according to Dr. C. J. Gahan, of the British Museum, from whom this description is taken, these spines are not present on the larvae of the powder-post beetles (family *Lyctidae*), and are therefore a distinguishing character.



The Furniture Beetle (*Anobium domesticum*)

The tunnels of the larva of the furniture beetle are more irregular in direction than those of the powder-post beetle, the powdery excretion is coarser grained than that of the powder-post beetle, and is not packed as tightly in the tunnels as in the case of this last-mentioned beetle.

Control Measures.

Where timber is badly infested it should be treated or else removed and replaced with fresh timber. Renewing the wood is generally only necessary where the furniture beetle has riddled floor boards, panels of shelving, or furniture, &c. In powder-post beetle attack the infestation is usually confined to the edge or to a comparatively limited proportion of the beam or board, which will be found to be the sapwood. Oil treatment alone is all that is generally needed to combat powder-post beetle attack.

With regard to treatment of timber infested by either beetle or by both, brushing or spraying with creosote oil is generally the most satisfactory, and where this oil penetrates and reaches any grubs or beetles within the

timber, these will be killed. The whole of the grubs cannot be destroyed unless the timber is saturated by a prolonged soaking, by immersion in heated oil, or by oil introduced under pressure. Such treatment can only be applied to the timber before use, being impossible once the timber is placed in position in buildings or furniture. The ordinary treatment, therefore, of timber in buildings or of furniture with an external coating of oil has a double purpose. Primarily it is intended to prevent borer beetles laying eggs and re-infesting the timber, but incidentally it is useful to kill any grubs or larvae near the surface.

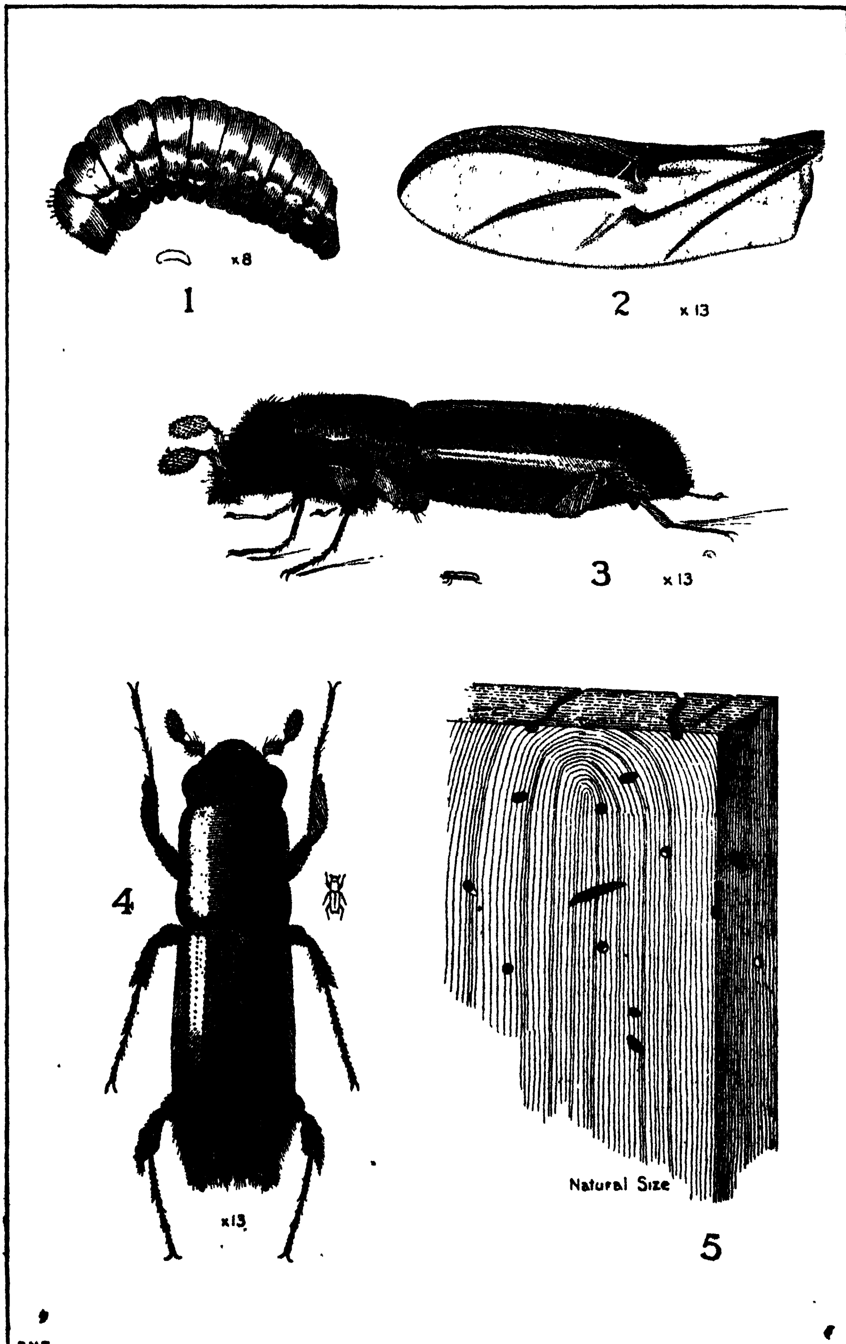
Creosote Oil.

The most satisfactory oil for general purposes is creosote oil where brown staining of wood does not matter, such as on floor boards, shelving, &c. Where a dark-brown staining is not desirable a refined creosote oil of a light colour, or a mixture of half kerosene and half creosote oil may be used. Where no staining is desirable at all, a mixture of nine pints of turpentine to one part of kerosene is preferable. The addition of paradichlorobenzene to the kerosene—a 5 per cent. solution—before adding this to the turpentine will make the mixture more effective, as the paradichlorobenzene is carried into the tunnels in the wood and acts as a fumigant as well as a deterrent. The turpentine and kerosene mixture is useful for costly furniture, and should be injected frequently, by means of a fine syringe, into the exit holes made by the adult beetles. Of course, it is a slow method and is resorted to only where pianos or furniture are concerned.

The application of heat to timber or to infested portions of furniture removed for treatment must not be overlooked where it will pay. Boards of an inch thickness, treated for a period of one hour at a temperature of 175 deg. Fah., will have all grubs, beetles, and eggs in the wood killed; for thicker wood longer periods of exposure or higher temperatures will be needed. On the whole, however, the cheapest and most satisfactory substance is creosote oil, avoiding dark-coloured or tarry crude wood-preserving oils. The use of creosote oil will be found effective, especially in the case of infestation of hardwood by the powder-post beetle. For the furniture beetle, which is more persistent, repeated applications may be necessary. In all cases it is desirable that the treatment should be applied during late September or early October, prior to the hatching of the adult beetles.

In addition to the above methods, where it is practicable or safe, such substances as benzene, carbon tetrachloride, and even solutions of corrosive sublimate (use this substance with the utmost care because of its extremely poisonous nature) may be used.

Fumigation, according to the furniture or woodwork attacked, may also be resorted to at times. Specially constructed chambers or gas-tight cylinders may be needed, and the gases employed, according to circumstances would be carbon bisulphide, hydrocyanic acid gas, sulphur fumes, benzene fumes, or carbon tetrachloride, &c.



The Shot-hole or Pin-hole Borer (*Platypus omnivorus* Lea).

1. Larva. 2. Hind wing. 3. Side view of the perfect beetle.. 4. Dorsal view. 5. Timber, showing the damage caused by the borer.

Shot-hole or Pin-hole Borers.

Shot-hole borer beetles of the families *Scolytidae* and *Platypodidae* produce shot-holes or pin-holes in trees and logs of some of our brushwoods and hardwoods. Felled logs are usually attacked, and sometimes matured trees, especially where the vitality is reduced. In his *Forest Insects and Timber Borers* (1927), W. W. Froggatt records the genera *Xyleborus* and *Crossotarsus* as attacking eucalyptus hardwood logs, and *Platypus omnivorus* as attacking brushwoods and hardwoods. Both *Xyleborus* and *Platypus* have also been recorded occasionally attacking weakly apple, plum, and apricot trees.

The characteristic habits of these beetles are that the adult beetles bore tunnels, limited in extent, within which they lay their eggs. The blind, legless larvae feed on the sap on the tunnel walls or on a special fungal growth called "Ambrosia," which develops on the tunnel walls. Weakened trees or logs present the most favourable conditions. After the logs are cut and the sap is eliminated, conditions become unsuitable for these beetles and their larvae to develop, and they will not survive. Thus boards after a short period of seasoning, although signs of previous attack may remain, cannot harbour these beetles, nor can the insects survive as pests of timber used for constructional purposes.

Shot-hole Borers Harmless in Sawn Timber.

Hardwood, such as tallow-wood (*Eucalyptus microcorys*), red mahogany (*E. resinifera*), &c., when sawn very frequently show pin-holes or shot-holes as the result of previous action by shot-hole borers. Unfortunately this often causes misconception in minds of timber merchants, builders, &c., especially as these timbers are much in demand for flooring, weatherboards, and general constructional work. In view of this we desire to reassure timber merchants, builders, and householders against any erroneous impression which may arise as to shot-holes or pin-holes observed in such timbers. These holes are entirely due to the previous action of shot-hole borers working in the green timber or logs, but which leave the sawn timber. Matured growing trees are likely to be attacked, and it is practically inevitable that all timber sawn from such trees will show pin-holes. It can be definitely stated also that these shot-hole borers of the genera *Platypus*, *Xyleborus*, &c., develop generally in trees of reduced vitality while growing, or in felled logs while there is still a supply of sap for them to live on. As soon as the sap is no longer available the beetles cease to exist, as these beetles are entirely dependent upon the supply of sap for the development of their larvae. Therefore, though sawn timber may show pin-hole tunnels of former beetle attack, the beetles do not survive long, and no further appreciable damage to the timber can result from this source after it has been sawn. Thus the habits of the beetle responsible for shot-holes or pin-holes are directly the reverse of those of the powder-post and furniture beetles, which only work in seasoned timber.

From shot-hole or pin-hole borers, therefore, there is no possibility of further damage occurring after the timber has been sawn and the sap is no longer available. They do not interfere with either the strength or durability of these timbers, and there is no ground for unnecessary anxiety and restrictions of trade because of shot-holes or pin-holes being present. Further, there is an entire absence of powder from pin-holes of shot-hole borers, and in this respect the damage can be easily distinguished from that of the powder-post and furniture beetles, which is characterised by the presence of powder issuing from the holes, and by the fact that these beetles do not usually make such straight, long tunnels as do the shot-hole borers. And, unlike the tunnel walls of other beetles, those of the shot-hole or pin-hole borers are somewhat blackened.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

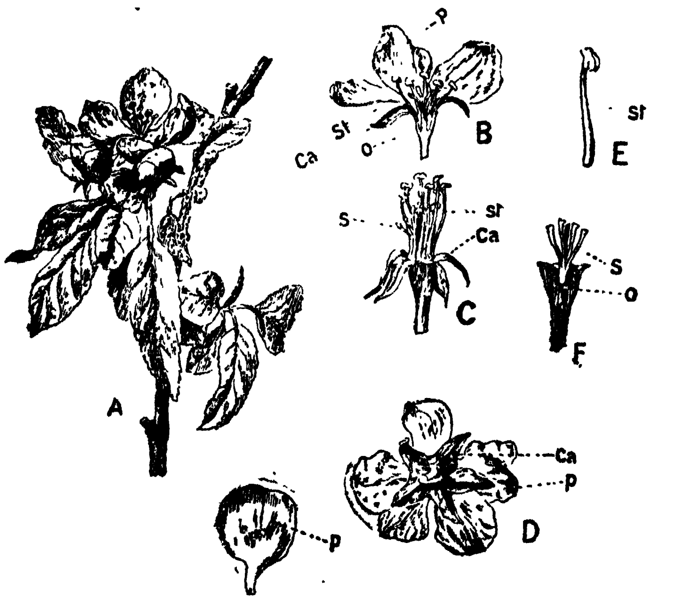
Owner and Address.	Number tested.	Expiry date of this Certification.
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 „ 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 „ 1928
Department of Education, Mittagong Farm Homes	30	22 „ 1928
Sacred Heart Convent, Bowral	11	23 „ 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 „ 1928
Dominican Convent, Moss Vale	4	24 „ 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	113	20 „ 1928
Marist Brothers' Training School, Mittagong	80	25 „ 1928
Blessed Chanel's Seminary, Mittagong	3	26 „ 1928
Waiaroi College, Orange	4	2 Sept., 1928
J. L. W. Barton, Wallerawang	16	11 Oct., 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	10 „ 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 „ 1928
Department of Education, Hurlstone Agricultural High School	33	10 „ 1928
Department of Education, Eastwood Home	16	16 „ 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 „ 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 „ 1928
Lunacy Department, Callan Park Mental Hospital	20	26 „ 1928
Miss Brennan, Arrankamp, Bowral	24	29 „ 1928
—. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 „ 1929
New England Girls' Grammar School, Armidale	17	12 „ 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 „ 1929
Lunacy Department, Kenmore Mental Hospital	99	17 „ 1929
Tudor House School, Moss Vale	6	22 „ 1929
Lunacy Department, Orange Mental Hospital	3	22 „ 1929
Australian Missionary College, Cooranbong	57	24 „ 1929
William Thompson Masonic Schools, Baulkham Hills	29	28 March, 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 „ 1929
P. F. Mooney, Calala	33	16 „ 1929
Department of Education, Gosford Farm Homes	16	16 „ 1929

—Max Henry, Chief Veterinary Surgeon.

Cross-pollination of Fruit Trees.

H. BROADFOOT, Senior Fruit Instructor.

POLLINATION is that process which results from the transference of pollen from the anther of a flower to the stigma. Some flowers are self-pollinated, that is, in each flower stamens and stigma are so arranged that pollen from the former falls directly on to the latter. Apart from such cases the most active agents of pollination are the wind and insects. Wind-pollinated flowers are usually inconspicuous and produce enormous quanties of pollen (this is necessary to make allowance for the great waste that occurs in wind distribution of pollen); they are usually without fragrance or nectar, and the pollen grains are light and dry, and thus easily air-borne. The long, feathery pistils with which they are supplied, are peculiarly well fitted to catch the wind-distributed pollen grains. Insect-pollinated flowers are usually conspicuous, and are frequently supplied with nectar and sweet scented. Not infrequently when individual insect-pollinated flowers are small, they are arranged in clusters, which form a conspicuous mass. The stigma is often sticky, so that pollen grains brought into contact with it



The Parts of an Apple Flower.
A, twig of apple: B, longitudinal section of flower: C, flower with corolla absent; D, view of flower from below; E, a single stamen; F, pistil with portion of calyx. (One-fourth natural size). *Ca*, calyx; *p*, petal; *st*, stamens; *s*, style, *o*, ovary. [*After E. Evans.*]

easily adhere, when insects (allured by the colours and the perfume, both indicative of the presence of nectar), carrying pollen dust from some previously-visited flower, brush against it.

Many flowers are wonderfully modified to prevent self-fertilisation, and to secure cross-fertilisation. The chief provisions against self-fertilisation are (1) pollen maturity does not synchronise with stigma receptivity in the same flower; the pistil most commonly matures before the stigma: (2) self sterility; some flowers are unable to set fruit from their own pollen: (3) structure of the flower; some flowers are so modified as to prevent self-fertilisation, and to secure cross-fertilisation.

In some varieties of apples, pears, plums, and cherries, as well as in some other orchard fruits, self-sterility is common. Apart from the result of fungous diseases, insect attack or frost, the persistent failure of fruit to set, year after year, on individual trees, or in orchard blocks, indicates self-sterility. The cause in orchard trees is not, as a rule, any structural or functional defect in pistil or stamen, but in lack of affinity between the two. It is worthy of note that the lack of affinity may be apparently due to local conditions, and it is not constant. A variety may be self-sterile in one place, and self-fertile in another. Soil and climate may be factors.

There are certain facts of great importance which have been established by experience. One is the value of interpollination. A self-sterile tree may often be made fruitful by planting near it another variety to supply pollen. The blossoming periods of the two must synchronise or overlap for an effective period, and between the two there must be affinity; the pistils of the self-sterile variety must be willing to accept the pollen of the other and to develop into good fruit. This affinity can only be discovered experimentally. Much has been done and much remains to be done in this direction; the field for experiment is a wide one. One fact that has emerged from experimentation is that many varieties of orchard fruits, self-sterile or otherwise, produce better fruit when fertilised with pollen other than their own.

The realisation of the necessity for cross-pollination has largely arisen from changed conditions. Until quite recently a great many varieties of the different kinds of fruit were grown by orchardists, and crop failure due to want of pollenizers was unknown. But as time went on, the grower recognised that specialisation in a few of the best commercial varieties was a better paying proposition than the growing of many varieties, some of which were of small commercial value. The new order of things brought fully to the understanding of growers the necessity of making adequate provision for pollenizers. Many growers had planted the same variety in large blocks, and in many cases crops were so poor that returns were disproportionate to the capital expended and the labour involved.

In actual experience cross-pollination is not without its complexities. Taking one example out of the many which might be adduced, it might be noted that the self-sterility of the London Pippin is held as an accepted fact; and yet it has, in certain seasons, and without cross-fertilisation by another variety, borne heavy crops. This exception has probably been due to the fact that in those particular seasons the stigma has reached the right stage

of receptivity, simultaneously with the attainment by the pollen grains of the right stage of effective activity. In other words, active and reactive efficiency of pollen and stigma have been simultaneous.

It has already been pointed out that insects are active agents in the transference of pollen from flower to flower. Of these insects the honey bee is the most effective for the setting of fruit. A visit to orchard trees in bloom on a sunny day will show thousands of bees gathering nectar and carrying pollen from one flower to another, busily carrying on work, not consciously, but most effectively, in the interests of the orchardists. By establishing a few hives of bees in or near his orchard, the fruit-grower ensures to himself the benefits derived from the industry of the busy bee as a pollenizing agent, and renders himself less dependent upon fortuitous circumstances.

As self-sterility is a marked feature of many varieties of apples, pears, plums, cherries and almonds, it is not advisable to plant any one variety alone. Fortunately different commercial varieties of each can be selected which are suitable for cross-pollination, and the grower can therefore increase his range of commercial fruits for marketing purposes, and at the same time effectively remove the obstacle of self-sterility. There is room here for knowledge and for judgment to play their part in the selection and distribution of varieties—the relative numbers of each and their positions in the orchard. Experience has demonstrated that any two of the four chief commercial varieties, viz., Granny Smith, Jonathan, Delicious and Tasma, when planted together, crop satisfactorily.

When selecting varieties for cross-pollination, there must be affinity between the two and their blossoming periods must synchronise or overlap. The overlap should extend over at least a week of the most effective blossoming period. If the overlap period be short, it is quite possible that unfavourable weather conditions may interfere for the whole of this period with the work of the bees, and a poor setting may result. It is important, too, when planting a new area, or when extending an area already planted, to see that the varieties for interpollination develop at approximately the same rate. If, for instance, the two varieties, Josephine de Malines and Packham's Triumph, are planted, the latter develops and blossoms before the former, and consequently the Packhams may be a few years without a pollinator. In such a case as this it is advisable to plant a third good variety, which will act as a pollinator; indeed it is always advisable to plant at least three varieties which are suitable for cross-pollination purposes. There are times when any one variety may fail to blossom or only develop very weak blossom buds; in such a case, if only two varieties have been planted, cross-fertilisation is not possible and crop failure may result. This risk is lessened if three varieties are planted.

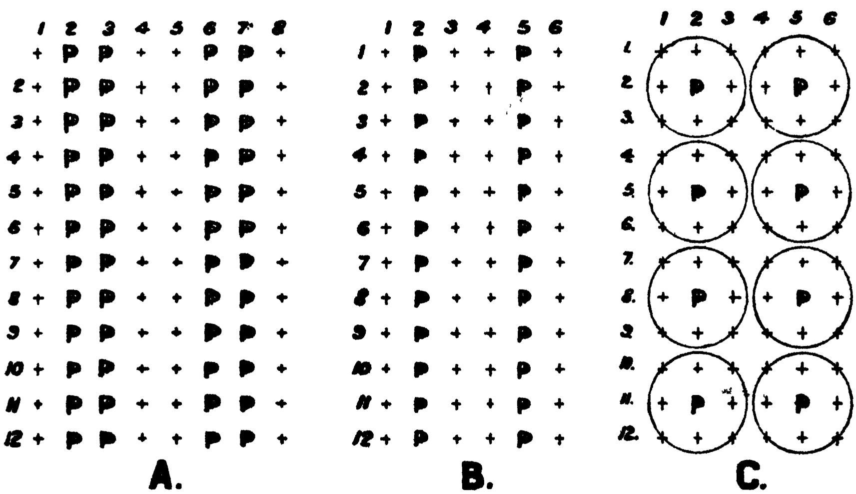
How Far Apart should Pollinators be Planted?

This is an important question, and observation and experience show that the best results are obtained when the trees are not more than one row away. If planting about the same number of several different varieties, all

of which are suitable for cross-pollination purposes, they may be planted in double rows. If a greater number is required of one or more varieties, they may be planted in double and single rows. The former arrangement makes for more economical working in regard to spraying, picking, etc.

There are times when an orchardist wishes to grow a preponderating number of one variety. In this case he will plant the pollinators not in rows, but at intervals in the rows. Two different varieties which are suitable for cross-pollination should be used as pollinators, and in order that the greatest number of the variety chosen may be planted, the two varieties which are being used for pollinators may be worked on the same tree.

It is invariably sound policy on the part of growers of pome fruits, such as apples and pears, and of drupes, such as plums and cherries, to assume that they are self-sterile, as it has been proved that even in the case of self-fertile varieties, cross-pollination is advantageous; and in addition to this,



Distribution of Pollenizers.

A Suitable when two or more interfertile varieties are required in equal proportion. B Suitable when one or more of the interfertile varieties is required in the proportion of two to one. C. Suitable when a minimum number of a pollenizer is required, all trees being in direct contact with the pollenizer

it has been proved conclusively that a variety of fruit may be self-fertile in one district and self-sterile in another, thus proving the existence of uncertain factors, and giving ground for the assumption that location and climatic conditions play some part in the process of fertilisation. As a striking example of this, the experience of Sims Bros., of Capertee, in the production of Kieffer pears, may be referred to. Their large block of Kieffers has carried heavy crops, although without pollinators, whereas in other districts the pear referred to has proved to be self-sterile under similar conditions. Clearly then, there are various important factors at work.

Almonds.

Brandis Jordan
Riverside
Large Paper Shell, Early Paper Shell
Hatch's Nonpareil
I.X.L.
Drake's Seedling
Texas Prolific
Golden State
Burbank's

Pears.

Kieffer
Le Conte
Chaumontelle, Forelle
Jorgonelle, Howell, Beurre d'Anjou
Monchallard, Bergamot d'Esperen, Beurre Clairgeau, Colonel Wilder
Josephine des Malines, P. Barry, St. Crespin, Baronne de Mello
Andre Desportes, Elizabeth Cole, Packham's Triumph, Beurre Superfin, Gansell's Bergamot
B. S. Fox, Doyenne de Richard, Washington, Zoe, Broom Park, Lawrence, Onondaga, Flemish Beauty
Louise Bonne de Jersey, Mme. Henri Desportes, Beurre d'Amanlis, Flemish Rose, Williams, Conference
Vicar of Winkfield, Idaho, Easter Beurre, Columbia, Winter Nelis, Althorpe Crasanne,
Winter Bartlett, White Doyenne, Anna Nelis, Clapp's Favourite, Doctor Reeder, Thompson, Doyenne Boussoch, B.D.C.
Doyenne du Comice, Fertility, Jean de Witte, Winter Cole, Madame Cole, L'Inconnue
Bailey's Bergamot, Autumn Beauty, Beurre Bosc, Spanish Bon Chretien, Packham's Late
Marie Louise, Gregoire Bordillon

Cherries.

Burgdoff's Seedling
California Advance
Eagle's Seedling, Early Purple Gean, Early Lyons
Bedford Prolific
Black Eagle
Florence, Ramen Olivar
Early Rivers, Werder's Early Black, Bigarreau Napoleon
St. Margaret
Black Tartarian
Black Republican Noble

Apples.

King of Pippins
Blondin
Isham Sweet, Lord Nelson
Gravenstein, Late Wine, Roxbury Russet
Ben Davis, Black Ben Davis, Cleopatra, Jewel, Kentucky Red Streak, Macintosh Red, New Water, Prince Bismarck
Belle de Boskoop, Dunn's, Granny Smith, Magg's Seedling, Ribston Pippin, Scarlet Nonpareil, Sharp's Early, Striped Winter
Glowing Coal, Margil, Oakland, Pioneer, Fameuse, Statesman, Stanard White Winter
Clayton, Crofton, Champion, Duke of Clarence, Gano, Irish Peach, Jonathan, Rymer, Stone Pippin, Twenty-ounce
American Golden Russet, Esopus Spitzenberg, Excelsior, Fall Pippin, Keswick Codlin, Nick a Jack, Sturmer, Scarlet Pearmain, Wagener, Wealthy, Yates
Delicious, Huon Pearmain, Rokewood, Shockley, Willow Twig, Ohio Nonpareil
Winesap, John Sharpe, Judson, King David, Rival, White Pippin
Emperor Alexander, Newtown Pippin, Milden
Blenheim Orange, Foster, Hoover, Thompson, Winter Strawberry
Buncombe, Cox's Orange Pippin, French Crab, Williams' Favourite
Late Prolific, Reinette de Canada
Bertha, Northern Spy
London Pippin, Worcester Pearmain
Annie Elizabeth, Rome Beauty

Provide for Pollination when Planting.

When an orchard is being planned in any fruit-growing district, the intending orchardist would be well advised to ascertain from the Department the best commercial varieties grown in that district, how they have cropped over a number of years, and the pollinators that have proved most satisfactory. If the orchard is to be planted in a new district, the capabilities of which are untested, similar information to the foregoing should be obtained from a district having similar soil and climate, including rainfall and altitude. Even then some subtle differences exist which the most careful scrutiny and inquiry may overlook, but such a contingency cannot be avoided, and such chances are minimised if the suggestions in regard to planting are carried out.

Grafting Pollinators in Established Orchards.

Most growers appreciate the value of making adequate provision for cross-fertilisation, but there are still many blocks of the same varieties of trees, the production of which, though fair, would increase if suitable pollinators were supplied. In these cases pollinators may be grafted upon the limbs of trees at suitable intervals throughout the block, or the whole of individual trees may be suitably grafted. If the latter method be adopted, the limbs should be cut not too close to the crown. When grafting old trees it is better to insert the grafts fairly high up on the limbs. On old trees when limbs are cut too near the crown, a big surface is exposed which very often does not heal, and the limbs die.

Working individual limbs is very satisfactory when the work is carried out in a skilful manner, but in this case too, high working of the limb is necessary—even higher working than when the whole tree is re-worked. If a limb is grafted low down, the old established limbs will shade and rob the graft, and thus reduce its chances of making satisfactory growth. Very frequently, pollinators worked in this way make little growth, even over a period of years. They just maintain a miserable ineffective existence. Even when the graft is inserted high up upon the limb, care should be taken to prevent its being sapped by growths from the limb upon which it was grafted. It cannot be too strongly stressed that to obtain the best results high working on an outside limb is necessary, as only by this method will sap be plentifully supplied and development follow.

A small twig, buried in a big tree and struggling for existence, just managing to produce a few blossoms, is no use as a pollinator. A strongly-developed limb that will carry many blossoms should be encouraged. A good plan for the first few years, or until the graft has sufficiently developed, is to pull the fruit from the pollinator after setting. This not only helps in the development of a good limb, but ensures a supply of blossoms every year. Frequently in the case of a graft which has developed moderately well (worse still, of course, when development is weak), development is seriously impeded if it bears much fruit, with consequent depreciation of its

value as a pollinator. Indeed, so serious may be the result that for the following year, blossom buds may fail to develop, and consequently the trees of the main variety left entirely without a pollinator.

Until grafts are grown for cross-pollination purposes on trees in blocks which have no pollinators, temporary substitutes may be supplied in the form of small limbs of suitable trees carrying plenty of blossom buds. The ends of limbs should be placed in water in receptacles (such as bottles or tins) and the branches hung in trees which require pollinating.

Whilst the general period of those tree activities which result in fruit production may vary from year to year as the result of weather conditions, the relative differences in blossoming periods of different varieties remain more or less constant. The graph on pages 542-3 shows the blossoming periods of the chief varieties (and some other varieties less extensively grown) of apples, pears, almonds, and cherries. For each variety a ten-day blossoming period is assumed. As mentioned previously, it does not always follow that because two varieties bloom at the same time or slightly overlap, that they are suitable for cross-pollination; the graph shows varieties whose blossoming periods synchronise or overlap sufficiently to make their value as pollinators worthy of a trial.

"Disinfectant" Flavour in Cream.

Several instances of cream apparently containing phenol, &c., were noticed during the season just completed, and on investigation at the farms, it appeared that certain farmers were in the habit of using disinfectants for the cleansing of dairy machines and utensils, &c. Although apparently rinsed off with boiling water, sufficient remained to contaminate the cream and cause it to be classed into a lower grade at the factory. In another case brought under notice it was customary on the farm for the milkers to wash their hands and the cows' udders in water containing a small amount of disinfectant, and not to rinse or dry them before milking. The disinfectant was gaining access to the milk in this manner, and the cream on delivery was affected with the "disinfectant" flavour.

These defects were remedied in the first-mentioned instances by substituting washing soda for the soapy disinfectant, and in the second case by eliminating the disinfectant altogether and using warm water and soap. The resultant cream showed no traces of the "disinfectant" flavour.

Another cause of inferior cream was found to be a certain proprietary ointment used on cows' teats, &c., as a healing medium. The manufacturers state that it will not taint the cream in any way, but careful experiments have proved this to be otherwise. The following method is recommended in all cases where teat ointment is being used. When the cow comes in to be milked, bathe the teats in warm water to remove the ointment, dry off and apply petroleum jelly or vaseline, and use this as an emollient during milking. Bathe as before on milking being completed, and apply the ointment to the affected parts as directed. This method, on being adopted by several farmers, was found to be effective in overcoming the defect in flavour referred to.—A. W. Walker, Assistant Dairy Instructor.

Root Knot and Other Eelworm Diseases.

R. J. NOBLE, Ph.D., Biologist.

ROOT KNOT OR ROOT GALL.

Root Knot or Root Gall causes serious damage in a very wide variety of plants. These include many field crops, ornamental plants, flowers and vegetables, fruit trees, nursery stock and a number of weeds.

The abnormal condition in the roots is due to the presence of a minute parasitic nematode or thread worm *Heterodera radicicola.* The disease frequently results in a dwarfed condition of the plants, which also are usually a paler green than normal, and such plants wilt readily during periods of hot weather. In severe cases the plants may be killed by the disease.

If affected plants are removed from the soil, swellings will be observed at various points on the root system. These galls or swellings vary considerably in size, from small enlargements on the root hairs to large knots upwards of an inch in diameter. (Fig. 1.) The swellings should not be confused with the small nodules on the roots of leguminous plants (peas, beans, lucerne, etc.) which develop as a result of the presence of beneficial nitrogen-fixing bacteria. True root nodules of this type are readily detached, whereas this is not the case with eelworm knots or galls. In addition to interfering with the normal movement of moisture and food materials through the plant, the root knots caused by eelworm also render the plants more liable to attack by diseases which gain entrance through the root system.

Eelworms may cause serious injury on potatoes, and the condition shows up conspicuously in the form of pimple-like outgrowths. The surface of the tuber later may become quite warty, roughened and discoloured, necessitating considerable wastage in peeling for table use. If one of these pimple-like outgrowths is cut across, the eelworm may be distinguished in the form of a small glistening body embedded in the tissue of the tuber.

Generally speaking the eelworm diseases are most serious in light soils and in crops which are grown during the warmer months of the year.

It has been determined that a single female eelworm may produce upward of 500 eggs, and under favourable conditions the eggs will hatch in a few days and produce mature eelworms within a month. In some sub-tropical regions ten generations of eelworms have been produced within a year. Thus it can be readily realised why the disease occasionally reaches such serious proportions.

It has been established that certain strains of eelworm may become adapted to certain specific plants. This is especially the case when one type of plant has been grown continuously in an infested area over long periods. Under most field conditions, however, the eelworm types belong to a number o different strains, thus restricting the grower's choice in plants in any rotation scheme for control of the disease.

The disease is most often introduced into the soil by planting seedlings, tubers, or young plants which are already affected with Root-knot.

Eelworms already present in the soil may be transferred to new areas by means of running water, cultivation implements, animals, etc.

Fig. 1.—Squash Root affected with Root Knot.

Control Measures.

1. Do not plant seedlings, nursery stock or tubers which are affected with eelworm.

2. In seed boxes, use only soil which is known to be free from eelworms. It may be necessary to sterilise the soil before use. On a limited scale soil may be sterilised by—

(*a*) treatment with live steam for 1 to 2 hours according to pressure available.

(*b*) addition of boiling water at the rate of 5 gallons to the cubic foot.
(*c*) baking small quantities of soil on a sheet of iron over a fire.
(*d*) treatment with formalin. The soil is well watered and then formalin (1 pint to 16 gallons of water) is applied at the rate of 1 gallon to the square foot. The treated area is then covered with wet bags for 24 hours. A second application should be made in like manner after 10 days.

3. Practise rotation of crops. Do not plant susceptible crops continuously in the same areas. There are a few crops which are resistant to eelworm and these include the cereals (*e.g.* oats, barley, wheat, rice, maize, sorghum and grasses), certain American varieties of cowpeas (*e.g.* Iron, Victor and Brabham)

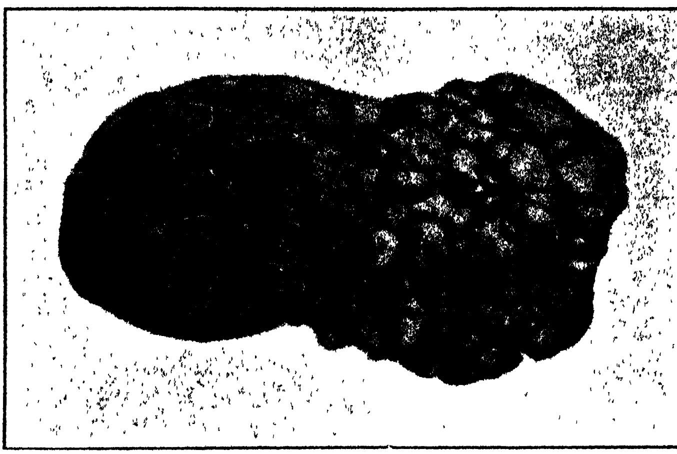


Fig. 2.—Potato attacked by Eelworms (*Heterodera radicicola*).

and velvet beans. Onions and peanuts are also fairly resistant. Keep down weed growth and try to starve the eelworms out of the soil. Much can be accomplished within two years if this procedure is followed.

In exceptional cases where a satisfactory rotation cannot be applied grow only crops which occupy the soil during the cooler months of the year.

4. Avoid spreading the disease by contaminated implements, etc. Cultivate clean areas before proceeding to areas which are known to be infested with eelworm.

5. Destroy diseased plants. Do not throw the refuse on to the compost or manure heaps. Potatoes should be boiled to destroy eelworms before being fed to stock.

EELWORM DISEASE OF LUCERNE.

This disease is caused by an organism which is distinct from those previously described. In this case the eelworm is found mainly in the aboveground portions of the plant, viz., the stems, and for this reason is often known as the Stem Nematode (*Tylenchus dipsaci.*)

Diseased plants are most readily picked out in the spring by the failure of growth in the affected stems. Later in the season this characteristic may be obscured by the growth of adjacent healthy plants. The young diseased shoots or sprouts are frequently swollen and pale yellowish or cream in colour. These may develop into shortened stems which are superficially normal in appearance, but which wilt readily during warm weather In more severe cases a thickened stunted stem only is produced. This type of growth later develops a brownish discolouration, becomes very brittle and breaks easily. (Fig. 3.)

Fig. 3.—Lucerne affected with Stem Nematode.

The development of the disease may be such as to kill out a lucerne stand within three or four years.

Control Measures.

1. Do not make hay for feeding on the farm from crops on diseased areas. In such cases it is preferable to turn the crop into silage.

2. Do not plant lucerne on infested areas until at least three years after all traces of lucerne plants have been removed from the area. Rotation crops should include principally cereals.

BULB EELWORM DISEASE.

A distinct species of eelworm *Tylenchus devastatrix* may be found attacking bulbs (*e.g.* daffodils and jonquils.) The disease may show up as flecks or lightly discoloured areas on the leaf blades, in the form of twisted and speckled leaves, or the leaf may be prevented entirely from developing. In the former case the flecks are slightly swollen in distinction to the marks on leaves which result from other causes.

The worms are present in the bulb scales and migrate down to the basal plate and thus infect the growing shoot, causing symptoms as described above.

Although carried over from year to year mainly in infected bulbs, a number of eelworms escape into the soil and infection of a new crop may be derived from the latter source.

Control Measures.

1. As in the case of the common root knot organism, soil sterilisation, crop rotation and destruction of diseased plants are important control measures. Where bulbs are grown on an intensive scale the crop should be examined closely during the growing period for the presence of disease.

2. Treat bulbs with hot water prior to planting. Dormant bulbs may be dipped in water kept at 110–113 deg. Fah. for three hours. The water can be kept at the required temperature if supplies of cold water and of boiling water are at hand to make the necessary adjustments. The treatment kills the eelworms without affecting the bulbs.

3. Unless newly introduced bulbs are known to be free from eelworm, they should be first treated with hot water and then sown in isolation before they are planted out in the main areas.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1928:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits .	620,985	107,493
,, Tomatoes..	4,642	...
	tons.	tons.
,, Melons ..	6	.
	doz	doz.
,, ,,	...	22
	lb.	lb.
Canned Fruits ..	15,812	23,492
Dried Fruits—		
Unspecified ..	13,524	448
Currants	7,434	392
Raisins	7,756	168
Apricots .	2,632	...
Apples .	4,984	..
Peaches .	3,052	...
Pears	2,016	.
Prunes ...	2,184	..

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	... .	...	8,627
Bananas ...	....	2,853	6
Lemons ..	....	...	495
Oranges ...	....	1,282	823
Grape Fruit ..	... .	5	...
Pears	.. ..	...	736
Pineapples ...	....	...	554
Other	....	123	1,616
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches, etc.	United Kingdom	207	...
	U.S.A.	46,940	...
	South Africa ..	1,100	..
Apples ...	....	...	351
Apricots ...	....	...	403
Currants	.. ..	...	1,876
Prunes ...	Canada	750	476
	U.S.A.	353,840	...
Peaches ...	.. ..	...	2,500
Raisins—			
Sultanas ...	U.S.A.	1,250	1,448
Other ..	Spain	657	940
	U.S.A.	7,577	..
Dates	Asia Minor ...	321,704	31,241
	Mesopotamia ...	77,464	...
Other—	.. ..	...	396
	Asia Minor ...	10,745	...
	China	3,822	...
	Italy	78	...
	Syria	216	...
	Turkey	6,720	...
	United Kingdom	742	...
	U.S.A ..	10,041	...
Preserved in liquor—			
Apricots ...	....	...	6,308
Peaches ...	....	...	7,769
Pears ..	....	...	5,561
Pineapples ...	....	...	16,438
Raspberries	....	...	10,601
Other ...	....	...	21,352

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—	
Bena	T. Jones, Birdwood, Forbes.
	N. C. Fitzpatrick, Erin Vale, Warre Warral.
	Hobson Brothers, Glenlea, Cunningar.
Canberra	E. J. Johnson, "Iona," Gunningbland.
	W. A. Southwell, Wilgrove, Galong.
	T. Jones, Birdwood, Forbes.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Trangie.
Cleveland	W. Burns, Goongiwarrie, Carcoar.
	Manager, Experiment Farm, Bathurst.
Federation	E. J. Johnson, "Iona," Gunningbland.
	H. Owen, "Apple Grove," Duri.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Temora.
Gresley...	H. J. Harvey, Kindalin, Dubbo.
Hard Federation	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, Linden Hills, Cunningar.
Turvey	Quirk and Everett, "Narrawa," Wellington.
	Hannett Bros., "Bonefoi," Cunningar.
	Hobson Brothers, Glenlea, Cunningar
Waratah	E. J. Johnson, "Iona," Gunningbland.
	G. R. B. Williams, Gerelgambeth, Ltd., Illabo.
	W. A. Southwell, Wilgrove, Galong.
	G. C. Chapple, "Ondiong," King's Vale.
	Chaffey Bros., Nemingha.
	Manager, Experiment Farm, Trangie.
	B. J. Stocks, Linden Hills, Cunningar.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	J. Berney, "Kildara," *via* Cumnock.
	Mailer Bros., Trundle.
	Manager, Experiment Farm, Temora.
Yandilla King...	Bradford Brothers, Nubba.
	R. A. Harricks, Horseshoe Vale, Dubbo.
	Hobson Brothers, Glenlea, Cunningar.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Earliana	H. Johnston, Hoxton Park, *via* Liverpool.
Marglobe	Manager, Experiment Farm, Bathurst.
Sunnybrook	H. Johnston, Hoxton Park, *via* Liverpool.

Potatoes—	
Carman	Johns Brothers, Strathalbyn, Myrtleville.
	M. Hoare, Myrtleville.
Early Manistee	J. J. Cusack, Stonequarry, Taralga.
	R. E. Ball, Stonequarry, Taralga.
Factor	R. E. Ball, Stonequarry, Taralga.
	E. McAlister, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
	K. Bowen, Springside, via Orange.
Satisfaction	J. J. Maloney senior, Stonequarry, Taralga.
	M. Hoare, Myrtleville, Taralga.
Up-to-Date	Johns Brothers, Strathalbyn, Myrtleville.
Broom Millet	Manager, Experiment Farm, Coonamble.
Maize—	
Wellingrove	Manager, Experiment Farm, Glen Innes.
Grasses—	
Sudan Grass	Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.
Sweet Sorghums—	
White African	Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Herd Testing and Conformation.

There has been a remarkable improvement in production, appearance, uniformity of type and constitution in the herds under test. I say emphatically that the type which our opponents said would be destroyed has improved, and it is not uncommon to see animals at distant country shows equal to those exhibited at the Royal Show in Melbourne. Testing does not, and cannot, destroy correct conformation; but ideas of type may destroy both production and constitution.——A. J. Gill, in the Victorian *Journal of Agriculture.*

If Dairying is to Progress.

If dairying is to progress, better methods are a necessity. The first reform is to provide fodder for the dairy herds. Feed the cows every year as plentifully as they were fed by Providence in 1924–25. The second reform is to breed up the herds, using pure-bred bulls of proved production strains. These can be got in all breeds. It is too expensive to buy high-grade cows in numbers, and, moreover, the other fellow only wants to sell his culls. Every farmer must breed his own heifers on right lines. The third reform is to select and cull out on systematic lines. This means using the Babcock test regularly to test for production. Cull out the low producers and keep heifers from the highest producers, using a good bull.—L. T. McInnes, Dairy Expert.

Dairy Salt.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist.

THE world's annual production of salt approximates twenty million tons. In Australia salt is obtained from: (1) Salt lakes in the western and north-western districts of Victoria, and from salterns near Geelong. (2) Shallow salt lakes in South Australia, chiefly on Yorke Peninsula, and from the evaporation of sea-water at the heads of Spencer's and St. Vincent's gulfs. About 50,000 tons, valued at £113,000, were produced in 1923 in South Australia. (3) Rottnest Island, Middle Island, Yarra Yarra Lakes, and at Lynton in Western Australia. Complete production figures for this State are not available.

In earlier times almost the whole of the salt of commerce was produced by the concentration and evaporation of sea-water, but at the present time the bulk of the world's supply is produced either by mining rock-salt or by evaporation of brine produced by dissolving rock-salt *in situ*. The manufacture of solar salt from sea-water is still an important industry in many countries, but can only successfuly compete with the production of salt from rock-salt when a cheap source of heat is available, as 90 per cent. of the water in sea-water must be evaporated before crystallisation occurs. Since it is difficult to produce a high-grade salt by simple evaporation and crystallisation, as in the solar process, most modern and up-to-date salt manufacturers, who desire to market salt in its most valuable form, refine the crude or low-grade salt by recrystallisation, or by re-washing, and by grinding and screening. On account of the extra work involved, pure salt commands a higher price than the crude salt.

When brine is evaporated in the ordinary way the crystals formed are hopper shaped and comprise: (a) Ordinary hopper-shaped crystals, (b) thin, flat formation, (c) multiple hopper crystals, and (d) thickened hopper-shaped crystals. When evaporated by the vacuum pan system the crystal formation is that of small cubical grains. The nature of the final product, however, whether coarse-grained or fine-grained, whether flaky like filaments of mica or cubical like minute dice, depends upon how the brine is evaporated.

Various grades of salt are manufactured according to the purpose for which the salt is to be employed, and the degree of purity required. The nomenclature of the various grades obtainable on the market varies in different countries. The characteristic properties of the several grades of commercial salt are imparted, to a very large extent, by the impurities present, and by the shape and size of the individual crystals. The taste, colour, odour, and hygroscopicity of commercial salts are dependent on the nature and amount of the substances other than sodium chloride in the salt.

Impurities Found in Commercial Salt.

Besides sodium chloride (common salt), commercial brands of salt may contain as impurities: (1) Calcium sulphate (gypsum); (2) calcium chloride; (3) magnesium chloride; (4) insoluble matter or sand. The amounts of impurities present are relatively small in the higher grades of salt and greater in the lower grades.

Pure sodium chloride is only very slightly hygroscopic, taking up about ½ per cent. of moisture from moist air at ordinary room temperature. It takes 100 parts of water to dissolve 35.7 parts of sodium chloride at 10-20 degrees Centigrade, and 39.1 parts at 100 degrees Centigrade (212 degrees Fah.). Sodium chloride has a brackish, saline taste but is not bitter.

Calcium sulphate is a white, odourless, non-deliquescent powder, with no marked or characteristic taste. It takes 100 parts of water at 10 degrees Centigrade to dissolve 0.19 parts of calcium sulphate and 0.20 parts at 18 degrees Centigrade. Calcium sulphate is, however, much more soluble in aqueous solutions of sodium chloride—100 parts of a 32 per cent. solution of sodium chloride will dissolve .57 parts calcium sulphate. A saturated aqueous solution has no very characteristic taste other than a suggestion of hardness.

Calcium chloride is a white (or nearly white), slightly translucent, and very deliquescent substance, and possesses a bitter and unpleasant taste, which is extremely difficult to mask or cover. On account of these properties the presence of calcium chloride in commercial brands of salt is undesirable and objectionable. It takes 100 parts of water at 10 degrees Centigrade to dissolve 65 parts of calcium chloride, and 74½ parts at 20 degrees Centigrade.

Magnesium chloride is a white crystalline deliquescent substance with a sharp, bitter taste. The peculiar bitter taste of sea-water is due to the magnesium salts present. Like calcium chloride the presence of magnesium chloride in commercial salt is also objectionable. Magnesium chloride is not so largely soluble in water as calcium chloride, and it takes 100 parts of water at 10 degrees Centigrade to dissolve 35 parts of magnesium chloride, and 35½ parts at 20 degrees Centigrade.

Insoluble matter or sand can scarcely be regarded as a constituent of commercial salt, its presence being accidental and due to contamination from air-borne dust with which it has come in contact during various stages of manufacture.

No Standardised Grades for Salt.

Industrial salt is manufactured and classified into several grades, the higher grades being made for domestic and dairy uses. No definite standards, however, have been laid down for the various grades. In America the standard suggested and adopted by the Association of Official Agricultural Chemists for dairy and table salt is as follows:—"A fine-grained crystalline salt containing, on a water-free basis, not more than 1.4 per cent. calcium sulphate, not more than 0.5 per cent. calcium and magnesium

chloride, not more than 0.1 per cent. matters insoluble in water." Queensland regulations provide that no salt containing less than 97 per cent. sodium chloride shall be used in connection with the manufacture of dairy produce. "Superfine dairy salt" is defined as containing not less than 99 per cent. sodium chloride and all must pass through a 40-mesh sieve. "Dairy salt" is defined as containing not less than 98 per cent. sodium chloride, all of which must pass through a 40-mesh sieve.

While it will be agreed that only a very pure salt is desirable for use in salting butter, opinion is by no means unanimous as regards limits of impurities permissable, or on the size, shape, and type of grain which is most desirable. Experience indicates that the presence of 0.2 per cent. magnesium chloride or of calcium chloride in a pure sodium chloride renders it hygroscopic, and imparts a slight bitterness to the saline flavour of the salt, which can be detected by a trained palate. This should possibly be regarded as a limit for salt, which is to be used for dairy purposes. Such salt should have a sodium chloride content approximating 99 per cent.

As regards the size of grain and type of salt desirable, one American authority states that for butter and cheese a thin flake permeates better than vacuum or crushed solar salt, and without forming local pockets of brine, which give a stinging taste and make the butter seem too salty; and that more pounds of flake can be used for a given quantity of butter. Another authority states that salt should be dry and of uniform grain, but he does not specify the size of the grain. So far as can be ascertained the size of grain most favoured in New South Wales is one between 1-40 and 1-60 inch; that is to say, smaller than 1-40 inch and larger than 1-60 inch.

The Role of Salt in Butter Making.

Salt is added to butter to give flavour to, and bring up the natural flavour of, the butter. It is also a preservative. The salt first dissolves in the diluted butter-milk left in the butter and precipitates the proteins; leaving a clear liquid of smaller viscosity than the butter-milk, and on this account runs more freely among the particles of butter.

As regards the action of salt as a preservative, it is claimed by some that such small amounts of salt as now used can have no appreciable antiseptic properties. The water in ordinary butter will contain approximately 10 to 12 per cent. salt, and while this possibly has little preservative effect it must have some, and must therefore have an effect on the keeping quality of the butter and retard the propagation of moulds.

Composition of Commercial Salt.

In order to ascertain the nature and quality of the salt used for dairy purposes in New South Wales, samples of all such salts on the local market were obtained. These have been analysed in the chemical laboratory of the Department, and the results are given in the following tables, Table I setting forth the chemical composition and Tables II (*a*) and II (*b*) giving the mechanical analyses of the samples.

TABLE I.—Chemical Analyses of Commercial Brands of Salt.

	Castle Brand Salt.	D.V. Salt.	Mermaid Butter Salt.	Lymm Salt.	Mermaid Cheese Salt.
	per cent.	per cent.	per cent.	per cent	per cent.
Water ...	·736	·124	·205	·106	·416
Insoluble matter ...	·054	·002	·040	·012	·005
Lime ...	·383	·049	·109	·079	·087
Magnesia ...	·064	·017	·040	·027	·053
Sulphuric acid...	·544	·041	·131	·033	·202
Chlorine ...	59·665	60·571	60·413	60·591	60·234
Probably existing in the following conventional combinations.					
Water ...	·736	·124	·205	·106	·416
Insoluble matter ...	·054	002	040	·012	·005
Calcium sulphate ...	·925	·070	·223	·056	·211
Calcium chloride ...	·004	·040	·034	·111	·117
Magnesium chloride ...	·152	·040	·095	·064	·033
Sodium chloride ...	98·129	99·724	99·403	99·651	99·218
	100·000	100 000	100·000	100·000	100·000
Combinations expressed on a moisture free basis.					
Insoluble matter ...	·055	·002	·040	·012	·005
Calcium sulphate ...	·932	·070	·224	·056	·212
Calcium chloride ...	·004	·040	·034	·111	·118
Magnesium chloride ...	·153	·040	·095	·064	·033
Sodium chloride ...	98·856	99·848	99·607	99·757	99·632
	100·000	100·000	100·000	100·000	100·000

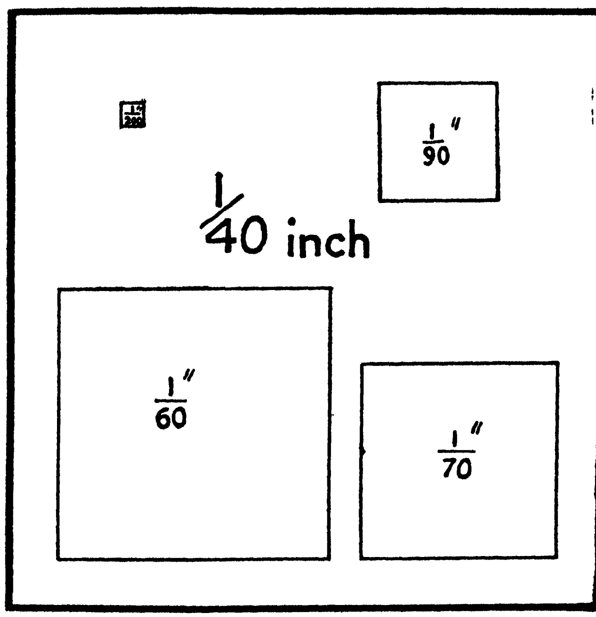
Of the samples received Castle Brand contained the greatest amount of moisture, followed by Mermaid Cheese salt, Mermaid Butter salt, D V. salt, and Lymm salt in that order. For purposes of adequate comparison the composition of the various brands has been calculated on a moisture-free basis. Of the brands examined, Castle Brand contained the greatest amount of calcium sulphate and Lymm salt the smallest amount. Calcium chloride was present in greatest amount in Mermaid Cheese salt and Lymm salt, and least in Castle Brand salt. Magnesium chloride was present in greatest amount in Castle Brand salt, and least in Mermaid Cheese salt. The largest amount of sodium chloride was found to be present in D.V. salt, followed by Lymm salt, Mermaid, and Castle Brand, in that order. The difference in sodium chloride content in D.V., Lymm, and Mermaid salt was, however, very small, the greatest difference being about 0.2 per cent.

As the presence of calcium chloride and magnesium chloride is undesirable in salt to be used for dairy purposes, it is interesting to note that the sum of these constituents is least in D.V. salt (.08 per cent.), followed by Mermaid Butter salt (.13 per cent.), Mermaid Cheese salt (.15 per cent.), Castle Brand (.16 per cent.), and Lymm (.18 per cent.). As regards chemical composition, D.V. salt, Mermaid Butter salt, Lymm salt, and Mermaid Cheese salt are of high quality, containing 99.6 to 99.8 per cent. sodium chloride on a water-free basis. Castle Brand salt, though approximating the brands named, contains about 1 per cent. less sodium chloride.

TABLE II.—Mechanical Analyses of Commercial Brands of Salt.

Size of Particles.	Castle Brand Salt.	D.V. Salt.	Mermaid Butter Salt.	Lymm Salt.	Mermaid Cheese Salt.
	per cent.	per cent.	per cent.	per cent.	per cent.
Larger than 1/40"	15·7	15·3	35·0	2·9	51·2
Less than 1/40", more than 1/60"	21·7	43·0	38·0	35 3	19·8
,, 1/60", ,, 1/70"	20·6	28·1	20·5	32·8	15·8
,, 1/70", ,, 1/90"	18·7	6·7	2·5	9·4	8·9
,, 1/90", ,, 1/200"	11·8	6·0	3·1	17·4	2·5
Less than 1/200"	11·5	0·9	0·9	2·2	1·8
	100·0	100·0	100·0	100·0	100·0

Referring to Table II, which shows the mechanical analyses of the different brands of salt, it will be noted that Mermaid Cheese salt and Mermaid Butter salt contain the greatest proportion of salt particles over 1-40 inch. Castle Brand and D.V, salt contain a lesser proportion, and Lymm salt the smallest proportion. Castle Brand contains the greatest proportion of particles less than 1-200 inch, the amounts in the others ranging from 1 to 2¼ per cent. It will be noted that all sizes of particles, *i.e.*, from 1-40 to 1-200 inch, are represented in the various brands, and are present in varying amounts, and although in the butter salts particles between 1-40 and 1-60 inch are present in the highest percentages (21·7, 43, 38, and 35), it could not be held that these predominated.

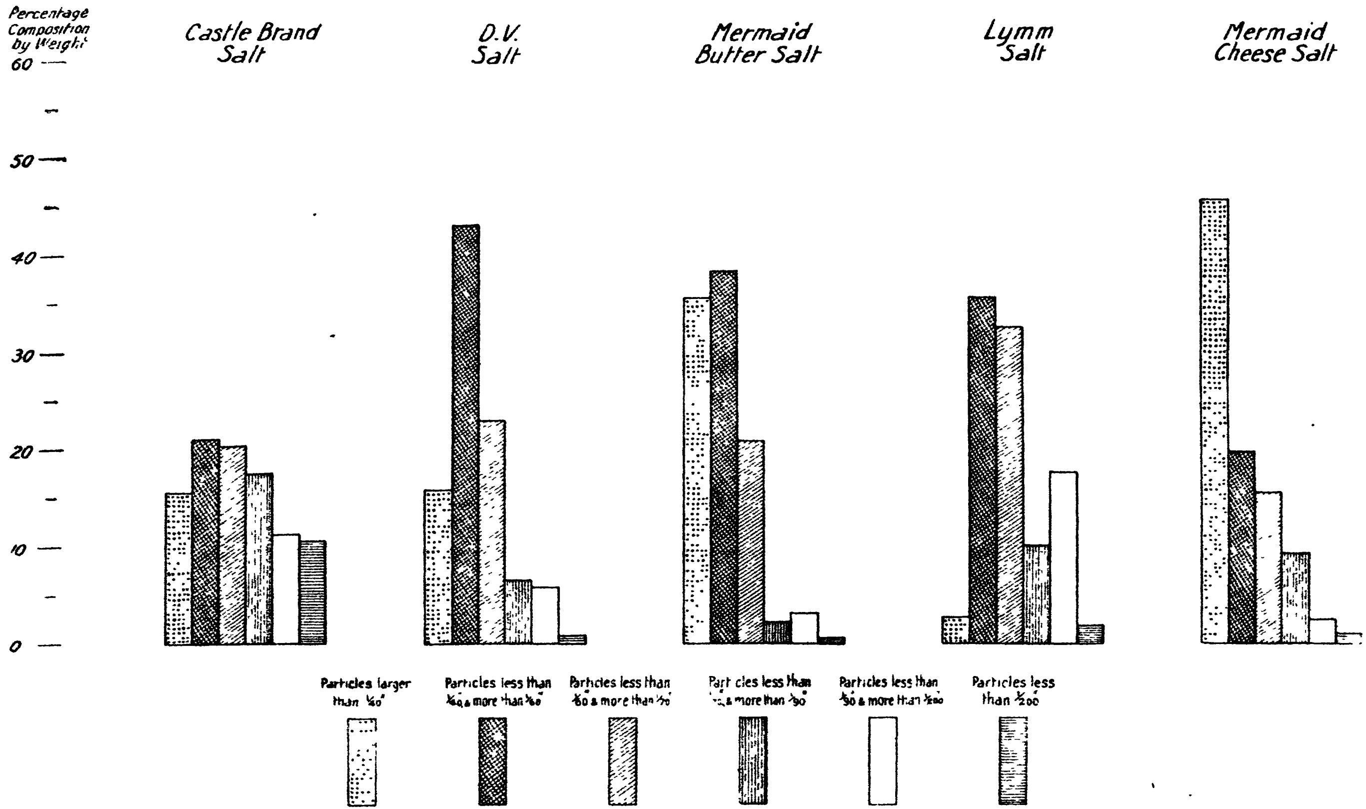


Graph showing Relative Sizes of Particles.

Uniformity in Size of Particles Desirable.

It has been suggested that butter producers are of the opinion that the best results are obtained from a salt consisting of particles not greater than 1-40 inch or less than 1-60 inch. In Table II (*a*) that size particle has been taken as a standard and the percentage of particles larger or smaller than this standard is given. The information is also given in the form of a graph. Inspection shows that in the various brands the percentage

GRAPHIC REPRESENTATION OF INFORMATION SHOWN IN TABLE II



of standard particles ranges from 21.7 to 43.0. The particles larger than standard range from 2.9 to 35.0 per cent., and particles smaller than standard range from 27 to 62.5 per cent.

In Table II (*b*), particles less than 1-40 inch and greater than 1-70 inch have been taken as standard. Here again the results are also given in the form of a graph. It will be seen that grouped in this manner the size of the particle taken as standard predominates in all the brands of butter salt examined, though the amounts range from 42.25 to 71 per cent. of the total particles. Particles larger than standard range from 2.9 to 35.0 per cent. as in the previous case, while the particles smaller than standard range from 6.5 to 42.0 per cent.

TABLE II (*a*).—Taking particles less than 1-40 inch and larger than 1-60 inch as standard.

	Castle Brand Salt.	D.V. Salt.	Mermaid Butter Salt.	Lymm Salt.	Mermaid Cheese Salt.
	per cent.	per cent.	per cent.	per cent.	per cent.
Crystals larger than standard	15·7	15·3	35·0	2·9	51·2
Standard size crystals	21·7	43·0	38·0	35·3	19·8
Crystals smaller than standard	62·6	41·7	27·0	61·8	29·0
	100·0	100·0	100·0	100·0	100·0

GRAPHIC REPRESENTATION OF INFORMATION SHOWN IN TABLE II (a)

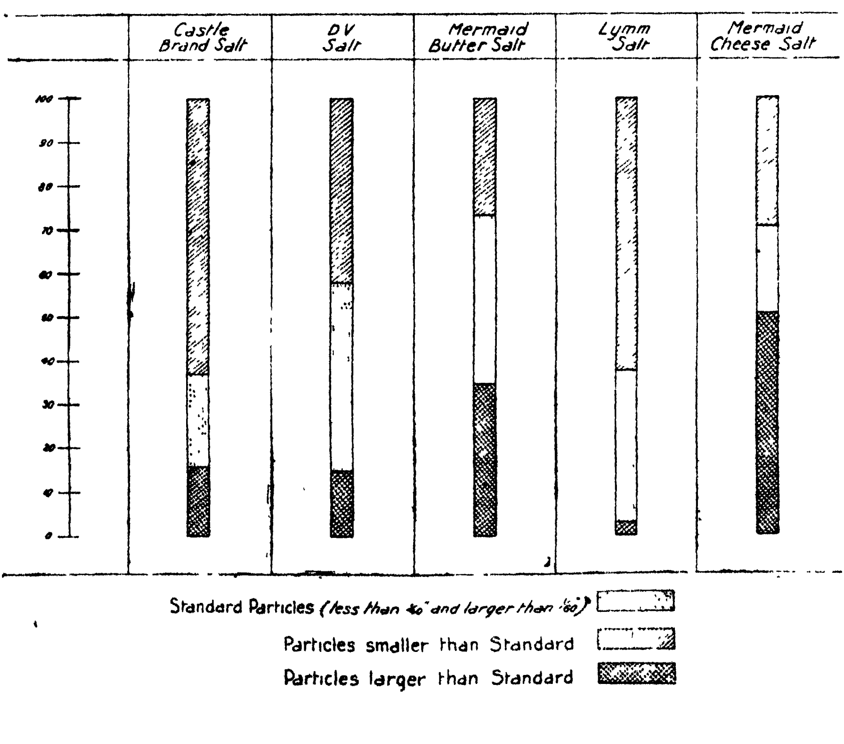
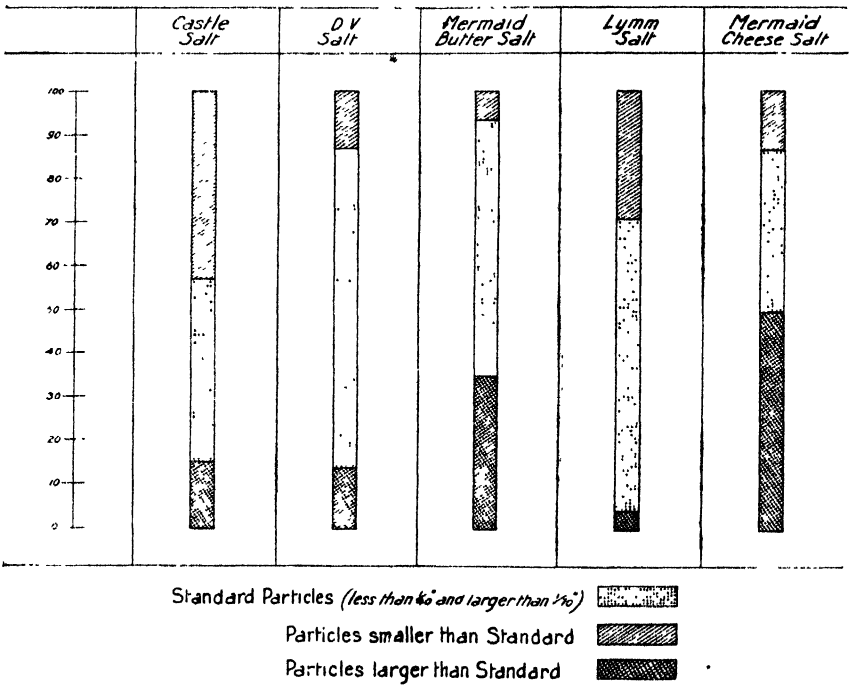


TABLE II (*b*).—Taking particles less than 1-40 inch and larger than 1-70 inch as Standard.

	Castle Brand Salt.	D.V. Salt.	Mermaid Butter Salt.	Lymm Salt.	Mermaid Salt.
	per cent.	per cent.	per cent.	per cent.	per cent.
Crystals larger than standard	15·7	15 3	35 0	12 9	51·2
Standard size crystals ...	42·3	71 1	58 5	68·1	35·6
Crystals smaller than standard	42·0	13·6	6·5	29·0	13·2
	100·0	100·0	100·0	100·0	100 0

GRAPHIC REPRESENTATION OF INFORMATION SHOWN IN TABLE II (b)



Conclusions.

As a general principle it appears reasonable to contend that in a desirable butter salt there should be a uniformity in the size of the particles. The upper limit for size might be taken as 1-40 inch. The presence of particles of 1-100 and 1-200 inch or less appear undesirable. Uniformity in the size of grain is desirable and 1-40 to 1-60 inch should be satisfactory. This would tend towards obtaining uniform solution of the salt when added to butter.

In the case of a pure sodium chloride this would not be of importance, but where the salt contains small or even minute quantities of calcium chloride or magnesium chloride there would be a greater tendency for

such particles to form centres of, and to produce, caking in the mass on account of the large surface area exposed to possible absorption of moisture from the atmosphere. This cementing action would probably be more manifest if the salt was contained in bags stored or stacked one on top of the other. The necessity for special care and attention to the storing of salt at butter factories cannot be too strongly urged.

It is not infrequently claimed by interested parties that particular brands of salt are more quickly dissolved in water and therefore a lesser amount of such salt will require to be used, or, in other words, it is claimed that the salt will "go further." The brands of salt examined show differences in chemical composition and in size of particle, but no difference in the rate of solubility was found, 15 grams of each brand being completely and readily dissolved in 100 c.c. of water in 30 seconds.

The analyses were carried out by Mr. C. R. Barker, to whom the author is indebted.

Spring *versus* Autumn Spraying for Red Scale of Citrus.

A SERIES of experiments carried out by officers of the Entomological Branch to determine the relative efficiency of spring and autumn spraying with miscible oil for the control of red scale on citrus trees has recently been concluded, and a short summary of the work is given below.

The experiments were commenced in the spring of 1922 at Castle Hill by Messrs. McCarthy and Hunter, who carried out comparative tests of spring and autumn spraying in the same orchard during the seasons 1922–23 and 1923–24. The spring sprayings took place in August and September, and the autumn sprayings in February and March. The spring applications for both years gave either no kill or only a partial kill of red scale, while the autumn applications gave very satisfactory results.

During the seasons 1925–26 and 1926–27 the experiments were repeated by A. R. Woodhill, at Baulkham Hills and Wyong, with similar results. Counts were made in the laboratory of approximately 600 scales from trees sprayed in the spring of 1926 and of an equal number from trees sprayed in autumn 1927, and the result was as follows:—

Time of year.	Per cent. scale killed by spraying.	Per cent. dead in control trees.
Spring	65	2
Autumn	95	9

The trees sprayed in the spring of 1926 showed a medium infestation by red scale in the autumn of 1927, while examinations of these trees made twelve months after treatment showed that the autumn-sprayed trees were practically free from scale, or showed only a slight infestation, while the trees sprayed in spring were very heavily infested.

If spring spraying is carried out it is necessary that it should take place before the young shoots appear, otherwise damage to the trees may result. On the whole, therefore, spring spraying is unsatisfactory, and a further spraying of the same trees in the autumn is necessary to obtain adequate control.—A. R. WOODHILL. Assistant Entomologist.

Poultry Notes.

JULY.

E. HADLINGTON, Poultry Expert.*

Prevention of Poultry Diseases.

To the average person who contemplates taking up poultry farming, the possibility of an epidemic of disease which would decimate his flocks is considered to be one of the main factors to contend with. There are also many already engaged in the industry who live in constant dread of some disease breaking out, and they resort to the use of disinfectants indiscriminately in order to ward off imaginary diseases, with the result that they often bring on some ailment which they aimed at preventing. For instance, the frequent spraying of poultry-houses with disinfectants, particularly if done late in the day, creates a damp or humid atmosphere for the birds to go to roost in, these being just the conditions which favour an outbreak of catarrh—probably to be followed by roup. In such cases the conditions caused by the misuse of disinfectants are not even thought of as a possible cause, it being considered that such so-called preventive measures were essential to ward off disease. As a matter of fact it is of little use deluging the poultry-houses with disinfectants in an endeavour to overcome unhygienic conditions.

There are other poultry farmers who are happy in the delusion that by constantly dosing their birds with medicines they will maintain the desired state of health and productiveness. Thus, for instance, one finds numerous cases where permanganate of potash is used in the drinking water occasionally to such an extent as to cause harmful results, and if mortality does not actually occur the effect of this practice is shown, perhaps, in a reduced egg yield or by a cessation of development in younger stock. Even the use of Epsom salts is sometimes abused, with the result that instead of being a valuable medicine it becomes the cause of a falling off in production. Similarly other medicines, which would be quite permissible if used rightly and in moderation, are often given to excess on account of the common obsession that it is necessary to keep dosing the fowls to ward off that spectre, disease.

Commonsense Methods.

In order to remove at least some of the misapprehension regarding disease, I would emphasise the fact that on a properly-equipped and well-managed poultry farm disease is one of the minor considerations. On the other hand, under bad conditions disease is likely to manifest itself, and remedies will be of little avail as long as such conditions exist.

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* Paper read at the Twentieth Annual Conference of Poultry Farmers, held at Hawkesbury Agricultural College, on 23rd June, 1928.

Although fowls are amongst the hardiest of live stock and are more resistant to disease than most animals, the better they are managed the less will be the risk of any serious disease. Therefore, the old maxim, "Prevention is better than cure," should be the guiding principle on every poultry farm. After all, the preservation of the health of the birds is largely a matter of commonsense methods and the adoption of the same rules as apply to human beings.

One of the most important factors is fresh air, and yet one may have well-ventilated poultry-houses and still, by crowding too many birds into them, bring about the same conditions as would exist in poorly-ventilated houses. I would say, emphatically, that crowding is one of the greatest evils in the handling of poultry, and is the cause of many of the troubles met with on a poultry farm. There are many ways in which crowding can occur, and often the farmer is unaware of what is happening until the development of some complaint results in investigations being made. Even then a solution is not always arrived at, because of a lack of knowledge of what constitutes crowding. In this connection there is no necessity to touch upon the obvious cases of crowding where too many birds are put into a given space, but rather with other aspects, such, for instance, as the practice of placing the perches too close together, thus creating a solid mass of birds, which swelter together and breathe in the exhalations from one another. Even if such conditions do not result in an outbreak of catarrh or roup, particularly amongst young stock, other ill-effects may ensue, such as a falling off in production, or a moult is most likely to be brought about in the late summer. To avoid such crowding, the perches should be spaced at least 20 inches apart, and approximately 7 inches of perch allowed for each adult bird.

The Effects of Crowding Young Stock.

Congestion may also be brought about by placing together a large number of half-grown stock in big houses. Young stock will invariably pack together at one end of the building no matter how much space there is on the roosts. This tendency is often overlooked, and because there is space left on the perches it is thought that no harm is done by running flocks of 150 to 200 young birds in one pen. This, however, is a mistake, and if the house happens to be a deep one with a low roof and little ventilation at the back, so much the worse for the health and condition of the stock.

To house young stock in flocks such as mentioned, at any rate before the summer is over, is to court trouble, either in the way of sickness or in lack of development, &c. For this reason the "colony system" of housing young stock after they have learnt to roost is the ideal way of handling them. On this system the houses are best built to accommodate about fifty birds, and should be spaced as far apart as possible. Several of these houses can be placed in one large enclosure, allowing at least 5,000 square feet of run to each fifty birds. This permits of practically free range, and if this system were more widely adopted, better developed, healthier, and more profitable birds would result.

Another cause of crowding which is perhaps productive of more disease and lack of development than any is that caused by placing chickens, which have not learnt to perch, in open-fronted houses. Numerous cases have come under notice where such conditions have been responsible for outbreaks of roup. What happens under these circumstances is that the chickens, in endeavouring to get warm, pack together into a corner and sweat. Evidence of this will be seen in that a number of the chickens lose their feathers, which is sometimes attributed to parasites, or to deficiencies in food, &c.

Chicken Troubles.

In the rearing of chickens, particularly during the brooding stage, there are more troubles encountered than at any other period of their lives. Many of these troubles have a common cause, yet there is a prevailing disposition to attribute most of their ailments to diseases which the fates have sent, without question as to whether the conditions in the brooder may have been primarily responsible. Every effect has a cause, and I want to say deliberately, as a matter of lifelong experience in chicken rearing, that the great majority of chicken diseases and ailments are preventable. It is a well-known fact, for instance, that with human beings there are many disease germs which lurk in our midst waiting an opportunity to gain a foothold, and anything which lowers our resistance renders us an easy prey for any organism to gain a hold. The same thing applies to poultry, and not until this is generally recognised will there be any material reduction in the enormous losses which annually occur in the rearing of chickens.

I am satisfied that the germs of such diseases as coccidiosis, white diarrhoea, &c., are present on most farms, and anything which occurs to lower the vitality of the chickens, such as getting chills, sweating, being crowded in a vitiated atmosphere, and so on, renders them susceptible to attack. Therefore, even if pathological examination discloses some definite disease among the chickens, one should not be satisfied merely to find out what the malady is, but should look round for the probable cause. In doing so, the happenings of some days previously have to be considered. It may be that the heating apparatus of the brooder cooled down during one night, the chickens may have been left out in a cold wind, or the brooders may have been overcrowded. These, and many other happenings, may not have been regarded seriously when they occurred, and so were forgotten by the time the chickens commenced to die; but it is only by giving consideration to such possibilities that many of the troubles will be accounted for. The question as to whether there may be constitutional weakness due to unsound breeding stock, or whether faulty feeding was responsible, must also be taken into account.

Factors in Brooding.

It can be safely said that a large proportion of chicken troubles are directly traceable to faults in brooding, and in this regard there are certain fundamental principles which are so vital to successful brooding, and yet so simple, that many fail to grasp their importance. They may be stated thus:

Any brooding system must be capable of generating sufficient heat in the coldest weather to prevent the chickens packing together—at the same time ample ventilation must be allowed to ensure pure air. Provision should be made to allow the chickens to move away from the heat zone to a cooler atmosphere if the temperature becomes too high. This can be affected by having a slitted curtain of heavy material, such as check Kersey, along the side of the brooder which opens into the run. With such a means of escape from the heat there need be no worry about a few degrees higher temperature than is stipulated. Any brooder which necessitates the chickens being shut in to retain sufficient heat is unsatisfactory, and is sure to lead to trouble sooner or later. Another important factor is that the inside runs should be large enough to avoid congestion when the chickens have to be kept in during wet or otherwise unfavourable weather.

The brooding equipment on a farm is the most important section, because, unless the chickens are properly reared, they will not grow into birds of strong physique, which is essential to high production, and they will lack resistance to diseases. Therefore, I would say, concentrate on this part of the farm, and provide good equipment, even if it necessitates makeshift arrangements in other sections. It is deplorable to see the wastage of chicken life annually taking place, much of which could be avoided if the significance of these few precautionary measures were fully appreciated and acted upon. The result would be a lessening of worry in the rearing of chickens and a greater measure of profit to the poultry farmer.

Bailliere's Atlas of the Ox.

We have received from Messrs. Bailliere, Tindall, and Cox, London, a copy of the "Atlas of the Anatomy and Physiology of the Ox," by Thomas G. Browne, M.R.C.V.S. This is a 1927 publication, and is on the same lines as the "Atlas of the Horse" by the same publishers. The present atlas contains eleven large plates illustrating, in detail, the muscles, skeleton, circulatory system, regions on the exterior of the ox, the digestive system, internal organs, reproductive system, the nervous system, obstetric presentations, specimens of pathological conditions, and an interesting group of figures showing the principal beef and veal cuts in different countries.

To quote the author, "the work is intended primarily for veterinary and agricultural students, and also for those who are making a study of meat inspection; but it is purposely couched in simple language so that the stock breeder and others who wish to know something about the digestive and other organs of the animals they own can readily understand the text and the accompanying illustrations."

An appendix giving a general account of meat inspection has been added, and figures illustrating diseased structures and butchers' joints are included for the special benefit of the meat inspector. Moreover, particular attention has been given throughout the text to those organs and other structures which are of special importance from the meat inspection standpoint.

In total the work contains 98 pages, including 139 figures.

Orchard Notes.

JULY.

C. G. SAVAGE and W. LE GAY BRERETON.

PRUNING can still be carried out on most of our deciduous fruit trees, with the exception of some varieties of stone fruit which start to blossom and shoot very early, such as King Edward VII and Bell's November peaches. In the Tableland districts pruning of most of the apples and pears can be continued till the end of August. However, it is always advisable to push this work through as fast as possible, for when delayed it interferes with other early spring operations. A free leaflet, "Pruning Deciduous Trees," is available for the asking, although the subject is more exhaustively dealt with in the book, "Pruning," which is now in its eighth edition. This book is also obtainable from the Department, the price being 3s., postage 3d. extra.

Ploughing.

Where the orchard has had an autumn ploughing, and if the land is still in loose condition and practically free from weeds, ploughing can be delayed till nearer spring. But if it has not received an autumn ploughing or has become compacted again, or if weeds are fairly thick, then ploughing should be completed by the end of the month. Ploughing should also be completed by the end of this month if the land is carrying a green manure crop.

As has been pointed out in previous years in these Notes, a green crop must be turned under by the end of July to give it time to rot, and thus make the plant-food it has absorbed available again for the trees in early spring. The bacteria which convert organic matter into humus require nitrogen, and very possibly phosphoric acid, in an available form. They cannot function in an acid medium, and in order to aid the formation of humus and to guard against the possibilities of locking up the nitrates and available phosphoric acid already in the soil to too great an extent in the early spring, it is advisable to make light dressings of sulphate of ammonia, superphosphate, and carbonate of lime when ploughing in green crops. If carbonate of lime is not easily procurable, lime should be slaked with water and scattered on the crop some weeks before applying the other fertilisers.

Planting.

Provided the ground is in good condition, planting of deciduous trees, except those that start early, such as the peaches already mentioned, can be continued this month. Though we prefer early planting, for reasons given in these Notes for May, planting of most apples and pears can be continued till the end of August in our Tableland districts if the land is in a suitable

condition. "Laying-out and Planting an Orchard" is the title of a free leaflet on this subject, and those interested can obtain copies from the Department.

Spraying.

Peach-leaf Curl.—Towards the end of this month, or early next month, peach and nectarine trees should be sprayed with lime-sulphur or Bordeaux mixture to control peach-leaf curl. Some of the very early blossoming varieties such as already mentioned should receive this application earlier.

Green Peach Aphis.—Where outbreaks of this pest are expected next spring, peach and nectarine trees should be sprayed with miscible spray oil (one part to twenty of water by volume) at the end of July or during the first two weeks in August. This spray, of course, must be omitted from varieties that blossom earlier than this. Much more detail on the control of this pest will be found in the Departmental leaflet on green peach aphis.

San Jose Scale.—In a general way, the Department has found miscible spray oil, diluted one part to twenty-five of water by volume, and applied at the end of winter before the trees start to shoot, more thorough than lime-sulphur for the control of San Jose scale. But at the same time some growers prefer the latter spray. If lime-sulphur is used for San Jose scale, care should be taken that it is mixed full winter strength and applied as late as possible just before the trees start into growth. It is preferable to use lime-sulphur on apple trees where the parasite *Aphelinus mali* is present for reasons explained later.

Special Treatment for San Jose Scale.

Generally San Jose scale is first observed on a few trees scattered through the orchard and it is worth while taking special measures to prevent it becoming widespread, as follows:—

Prune the affected trees early and place the prunings at once into the lighted burner, taking care when pruning these trees that the pest is not carried to clean trees by the pruner's clothes or pruning tools. The clothes should be washed or thoroughly brushed—not forgetting the hat—and the tools thoroughly cleaned with neat kerosene after completing the pruning of the affected trees and before they are allowed to come in contact with clean trees. The affected trees should then have a soaking application of miscible oil (one part to twenty-five of water by volume). As a soaking spray when applied to big trees takes a large quantity of spray, much of which collects in a pool at the butt and is liable to damage the bark at the collar at ground level, it is best, first, to spray the butt, then to throw in soil round the butt, give the tree a soaking spray, and when the job is completed throw the soil which has collected the oil spray away from the butt into the centre of the row. As it is probable that the surrounding trees have a few specks of scale that have not been detected, the whole block of trees, including those which have had special treatment, should receive a normal application of miscible spray oil (one part to twenty-five of water

by volume) at the end of the winter and before they start into growth. With care, orchards in most localities can be kept free of San Jose scale, but once it becomes widespread it is very difficult to eradicate absolutely.

Woolly Aphis.

Fortunately since the introduction of the parasite *Aphelinus mali*, spraying for woolly aphis has become very much less necessary, but if in places the parasite has failed to keep down the woolly aphis, and it is necessary to check it, tobacco wash or nicotine sulphate should be used. Investigations carried out by the Entomological Branch of this Department have shown that neither nicotine nor lime-sulphur spray kills the wintering *Aphelinus mali*, but that oil sprays kill a large percentage. The leaflets on woolly aphis are available on application to the Under-Secretary.

Citrus Fruits.

Harvesting will occupy most of the citrus-grower's time for the next three or four months. Wall charts and diagrams for packing oranges designed by Mr. R. J. Benton have recently been issued by the Department, and growers are recommended to write for copies.

To Raise *Pinus insignis* from Seed.

The Department has found the following method of raising *Pinus insignis* seedlings quite successful :—Sow the seed in drills about 12 to 15 inches apart, and then cover with about ¾ to 1 inch of soil. If the seedlings are required for potting, sow fairly thickly in the drills, but if required in large quantities for despatch as open-rooted plants, sow in drills in the same way, but use only twelve to sixteen seeds to the foot. By this latter method plants can be grown to a height of from 1½ to 2 feet before planting out, but should, once or twice before reaching that stage, have the spade put under them to cut the roots.

The most suitable months for sowing the seed are September and March.—G. F. Hawkey, Superintendent, State Nursery, Campbelltown.

The Effect of the Stock on the Graft.

Can the stock permanently affect the true hereditary characters of the graft ? The affirmative answer has often been given. But the results of careful experiment entirely rule out the possibility. The developing graft, which becomes the " top " of the tree, is intimately affected by the kind of stock on which it is placed. The effect, however, is purely physiological. Whatever peculiar specific influence the stock exercises on the graft is due to its exercising root functions for the graft. The graft is not permanently affected. Its true hereditary characters remain unaltered, and if shoots from it were grown on their own roots, they would grow true to the type to which the original graft belonged.—F. L. Engledow, in "Agricultural Research in 1926."

CONTENTS.

By Appointment to *H.M. King George V.*

Let the Leyland Fleets speak for themselves!

Below are a few prominent Australian fleets:—

Royal Australian Air Force	64
Postmaster-General's Department	20
N.S.W. Railways	41
N.S.W. Public Works Department	32
Sydney Municipal Council	36
British Imperial Oil Co.	62
Commonwealth Oil Refineries Ltd.	10
Nestle & Anglo-Swiss Condensed Milk Co. (A.) Ltd.	15
Messrs. Beard, Watson & Co., Sydney	13
Motor Transport Co. of Sydney	9

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Agricultural Gazette of New South Wales.

Fodder Conservation Competitions, 1928.

R.A.S. SOUTH COAST CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

DISTRICT fodder conservation competitions were organised by five agricultural societies, viz., Albion Park, Bega, Camden, Moruya, and Tilba Tilba, and in each instance the winner of the local competition was eligible to compete in the Championship Competition conducted by the Royal Agricultural Society. As an initial effort this entry must be considered as very encouraging, and is sufficient evidence that many South Coast farmers already realise that in order to achieve success at dairy-farming, foddor reserves must take an important place in the farm economy. To conserve fodder for use during periods when pastures and fodder crops fail is one of the soundest investments that can be made by dairy-farmers. High land values and the increased costs of production render it imperative that higher average returns must be secured from farm lands, and in order to achieve this purpose sufficient fodder should be provided to maintain their dairy herds in good condition at all times. It is not only periodical droughts for which preparation should be made, but for best results it is necessary to provide the fodder for a few months during the winter of every year, at which period the pastures are usually sparse. The feeding of the herd to maintain milk production during the winter months is of greatest importance, for dairy products are of the greatest value at this period of the year, and if arrangements are made for cows to calve during the early winter months they will produce well as the result of hand feeding through the winter months, and when the pastures are available in the spring there will be another flush in the milk flow, and the lactation period will thus be lengthened. The provision of fodder for the herd during the winter will result, not only in the maintenance of condition and milk production of the cattle over the period of feeding, but it will assist in increasing the production during the early summer months, by reason of the fact that the pasture will then be utilised for milk production instead of for restoring the condition lost during the winter. Thus the feeding of the cattle during the winter must result in a substantial increase in the annual milk production of the herd.

The conditions and scale of points for judging the competition were as follows:—

CONDITIONS.

Fodders Eligible for Competition to be: Concentrates (including all grains); roughage—as hay (lucerne, oaten, wheaten, clover, grass), silage; and any other fodder suitable for conservation—all to have been produced on the land owned, leased, or held on shares by the competitor. Fodder conserved over a period of more than four years will not be eligible.

* Mr. Stening judged the championship competition and this article comprises the text of his report.

SCALE OF POINTS—COASTAL AREAS.

		Points.
1. *Suitability and Quality of Fodder*		65
(*a*) Judged according to the suitability of fodder or combination of fodders for the purpose for which they are required	30	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	
2. *Location and Protection*		40
(*a*) Locality.—Location of the site having regard to fire, flood, economy in feeding, and general access	20	
(*b*) Protection.—Protection from weather, pests, stock, fire, and general deterioration	20	
3. *Economy in Production*		25
Including land value, production, storage, and feeding costs.		
4. *Carrying capacity*		60
Quantity for the requirements of competitor's holding to be based on the carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per cow to be 20 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay=1½ cwt. cereal hay=3 cwt. silage=½ cwt. grain.)		
5. *Quantity of Fodder in Excess of Requirements*		10
At the rate of 5 points for surplus fodder equal to quantity required for the holding.		
Total		200

Judging was commenced at Bega on 11th June, 1928, and was completed at Camden on the 14th June.

The points awarded each competitor were as follow:—

SOUTH COAST Fodder Conservation Championship Awards.

Society.	Competitor.	Suitability and Quality of Fodder. (a)	Suitability and Quality of Fodder. (b)	Location and Protection. (a)	Location and Protection. (b)	Economy in Production	Carrying Capacity.	Quantity in excess of requirements	Total.
1. Camden ...	E. H. K. Downes, Brownlow Hill, Camden.	24	31	15	18	23	60	7	178
2. Tilba Tilba...	H. Jeff Bate, Durham Farm, Bodalla.	26	32	19	18	19	60	1	175
3. Moruya	Norman Bate, Old Bodalla, Bodalla.	25	31	18	17	19	60	3	173
4. Albion Park	A A. Gorrell, Glen View, Yallah.	20	26	17	17	22	60	5	167
5. Bega ...	Guthrey Brothers, Elmgrove, Bega	27	31	19	19	20	32	...	148

Much credit is due to Mr. E. H. K. Downes for his success in winning the Championship. His property is 550 acres in area, and of this 40 acres were under lucerne, 33 acres produced cereals for hay purposes, 28 acres were

cultivated with fodder crops, and the balance of the property was under pasture. The fodder conserved on the property is as follows:—

Kind of fodder.	Year of harvest.	Quantity
		Tons.
Silage—chaffed cornstalks and sorghum (2 pits)	1928	112
Silage—chaffed cornstalks, and sorghum and lucerne (1 pit) ...	1928	56
Silage—cornstalks (1 pit)	1928	60
Silage—chaffed sorghum (1 pit)	1926	60
Silage—lucerne (1 pit)...	1926	95
Silage—oaten (1 pit)	1926	105
Oaten hay	1927	12
Lucerne hay	1927–28	38
Grammas	1928	60
Maize and sorghum seed	1928	13
Total...	......	611

With this large amount of fodder, Mr. Downes is in an unassailable position, which must give him a great sense of security, for it is sufficient to feed the total number of stock that the property is capable of carrying for a period of twenty-two months, which is more than double the specified feeding period.

The whole of the silage was conserved in underground pits, and was all of good quality with the exception that some of the material was a little over-mature when pitted. It was all well protected with a covering of from 2 to 3 feet of earth, which had been formed with a good "crown" to throw off rain-water, and as a result the fodder was perfectly conserved and with practically no waste. As some of the pits were some distance removed from the feeding stalls, points were lost for "location."

The lucerne hay was of good quality, and the stacks were well built on a foundation of timber and were well protected from weather by galvanised iron roofing, and fenced from stock. The grammas, when sliced with the turnip slicer as was the practice, would assist in improving the palatability and nutritiveness of the ration; they were, however, some little distance from the feeding stalls. The grain was stored in a well-constructed corn crib, which was mouse-proof, and allowed of ample ventilation.

Mr. Downes has set an excellent example in fodder conservation to all dairy-farmers throughout the State, and his success should encourage others to do likewise and thus place their business on a sounder basis.

The second prize was won by Mr. H. Jeff Bate, of Durham Farm, Bodalla, whose property has an area of 180 acres, of which 146 acres is in pasture, 4 acres under lucerne crop, 27 acres was used for cultivation of other fodder crops, and 3 acres for cereal crops for hay. The conserved fodders consisted of 145 tons of silage of chaffed cornstalks, 19 tons lucerne hay, 8 tons oaten hay, 1 ton grass hay, and 7 tons maize grain. The silage was conserved in twin reinforced concrete silos, well-roofed, and adjacent to the feeding stalls, and the hay was stacked on timber dunnage in a hay shed

well protected from weather and very close to the feeding centre. The whole of the fodder was of good quality and convenient of access for feeding.

Mr. Norman Bate secured the third prize, scoring only two points less than the winner of the second prize—the two properties adjoining. The area of the holding is 250 acres, of which 208 acres is pasture, 6 acres under lucerne, 20 acres cultivated with other fodder crops, and 16 acres with oats for hay. The total quantity of fodder was 226 tons silage of chaffed cornstalks, 34 tons oaten hay, 22 tons lucerne hay, 2 tons grass hay, and 11 tons maize grain. The silage was conserved in two silos, one constructed of reinforced concrete, and the other of concrete bricks, both of which were well roofed and adjacent to the feeding stalls. The hay was stacked in sheds, but was not very convenient of access, and the wheaten hay was not protected from damage by rats and mice, which are particularly fond of this class of fodder. The silage was of good quality, but the quality of the hay was not quite as satisfactory.

It was most gratifying to find that the methods of fodder conservation adopted by every competitor in the Championship were of such a high standard. Four of the five competitors had stored sufficient fodder for the feeding of the number of cattle their properties were capable of carrying when under natural pasture for a longer period than the nine months stipulated. Moreover, the quality of the fodders, the suitability and economy of the combination of corn silage, lucerne hay, and ground maize for providing a balanced ration, the effective protection from deterioration, and the convenient location of the conserved fodder for feeding purposes, were generally highly satisfactory; in fact, such a degree of all-round excellence was attained that it was far from being a disgrace to occupy the lowest position in order of merit in the competition, the only defect in the exhibit which scored the least number of points being that the quantity of fodder was insufficient.

The concrete overground silo is, undoubtedly, the best for the dairy-farmer by reason of its permanency, general efficiency, and convenience for feeding in all sorts of weather. The cost of construction of concrete silos, however, is high, and to those who are not in a position to incur such expenditure, the "trench" or pit form of silo should commend itself. Mr. Downes has conserved silage by the trench method for a number of years and prefers this form of silo to the tub silo, two of which he had formerly, and his experience should remove any doubts that might have existed as to the suitability of this form of silo for coastal districts. Mr. Gorrell, winner of the Albion Park competition, has also successfully adopted the trench system of making silage. In selecting a site for the pit, it is essential that it should be above flood level, and that the subsoil should be sound and non-porous, so that there is no danger of seepage into the pit.

The quality of the silage in one or two instances was affected by reason of the fodder being over-mature at the time of harvest, and through having been touched by frost before harvesting. The condition of the crop and the

moisture it contains are large factors in influencing the quality of the silage, and best quality silage cannot be produced if made from overripe or over-dry material, nor from immature or excessively wet crops. Both extremes should be avoided, and the crops utilised at a stage of maturity when they are still succulent, but not so succulent that their juices will be pressed from them on being packed in the silo. While a certain amount of weight is lost as the result of a crop being cut by frost, it is preferable to take this risk rather than to pit the crop when immature.

Unit Values of Fertilising Materials.

The unit values of fertilising ingredients in different manures for 1928 are as follows:—

	Per unit. s.	d.
Nitrogen in nitrates	22	0
„ ammonium salts	17	3
„ blood, bones, offal, &c.	18	11
Phosphoric acid in bones, offal, &c.	5	3
„ (water soluble) in superphosphate	5	8
Potash in sulphate of potash	6	8

To determine the value of any manure, the percentage of each ingredient is multiplied by the unit value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4	×	18s. 11d.	= £3 15s. 8d.	= value of the nitrogen per ton.
20	×	5s. 3d.	= £5 5s. 0d.	= „ „ phosphoric acid per ton.
			£9 0s. 8d.	= value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, etc. It is simply intended as a standard by which different products may be compared. At the same time it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.

The sharp rise in value of nitrogen and phosphoric acid in bonedust and blood and bone mixture is particularly marked. The unit value of phosphoric acid is 5s. 3d., being only slightly less than the unit value of water-soluble phosphoric acid, and the value of the organic nitrogen is 18s. 11d. as compared with 17s. 3d. for nitrogen in ammonium salts.—A. A. Ramsay, Chief Chemist.

The effect of adverse seasons on the sheep flocks in New South Wales is apparent in four directions, viz., losses by death attributable mainly to lack of fodder and water, increase in the slaughtering of fat stock, decrease in lambing, and increased export to other States.

Fallowing Competitions, 1927-28.

FURTHER REPORTS FROM JUDGES.

Central-western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

FALLOWING competitions were conducted in the Central-western District this season by the Pastoral and Agricultural Associations at Grenfell, Cowra, Eugowra, and Molong, and by the Cranbury Branch of the Agricultural Bureau in the Canowindra district. There was a substantial falling-off in entries compared with last season, not due to lack of interest on the part of wheat-growers, but to the exceptionally heavy summer rains which caused a phenomenal growth of Stink grass (*Eragrostis major*), which was very difficult to control, as well as to severe washing of the fallows in undulating country, particularly in the Greenethorpe section of the Grenfell district.

The general standard of the fallows inspected was high, and is evidence that the lessons of the competition are being well learnt. There is no doubt, also, that, taking the district as a whole, there has been a most noticeable improvement in fallowing methods in the last four or five years, in which improvement these competitions have played an important part.

The Season.

The winter and early spring of 1927 were exceptionally dry up to the end of September, when good rains—incidentally, they saved the wheat crop of that year—were experienced. It was, therefore, impossible to do any early ploughing in a satisfactory manner, and the majority of fallows were not turned over until springtime. November rainfall was heavy, but December averaged under an inch. From January to March, inclusive, the rainfall was heavy, approximating 10 inches at Grenfell and Cranbury, 8½ inches at Cowra, and 8 inches at Eugowra.

The following table shows the rainfall recorded during the fallowing months at each centre:—

Month.	Grenfell.	Cowra.	Eugowra.	Molong.	Cranbury.
1927.	points.	points.	points.	points.	points.
June	97	86	83	79	62
July	84	80	95	72	62
August	105	74	24	160	94
September	124	250	261	193	179
October	280	194	111	181	242
November	338	284	218	355	245
December	92	80	6	248	130
1928.					
January	312	196	238	287	256
February	540	342	236	829	500
March	144	290	272	336	273
Total... ...	2,125	1,876	1,544	2,740	2,043

The worst effect of the heavy and incessant rain was the luxuriant growth of weeds on the fallows, Stink grass in particular. Generally speaking, the weed growth could not be controlled by sheep or destroyed by tine cultivating implements, and the employment of the disc cultivator or skim plough was, therefore, widely adopted. A very damaging effect of the heavy rainstorms was the soil erosion on fallows in undulating country. Unfortunately, the worst sufferers were those who had their fallows in the best condition, *i.e.*, nicely compacted, well mulched, and free from weed growth. It was very disheartening for farmers who had their fallows in what could be called, under normal circumstances, an ideal condition to see them washed away or scoured out with deep gutters, while those whose fallows were covered with a thick mat of Stink grass and uncultivated suffered very little in comparison.

Scale of Points.

In these fallow competitions, points are awarded by the judges as follows:—Moisture, maximum 35 points; mulch, 35 points; cleanliness, 35 points; compactness, 35 points; condition of headlands and finishes, 10 points; total maximum, 150 points.

AWARDS in Central-western District Competition.

Society.	Name.	Moisture	Mulch	Cleanliness	Compactness.	Condition.	Total.
Grenfell	H. Spackman	32	30	34½	31	9½	137
Cowra	F. C. Rowlands and Sons	34	32	35	32	10	143
Eugowra .	F. Mulligan	34	33	34	33½	9½	144
	W. T. Bradford	34	33	34½	33	9½	144
Molong	J. Cauldwell	33	33	35	32	9	142
Cranbury Bureau...	J. Ward	34	34	34½	32	9½	144

Details of Winning Fallows.

H. Spackman (Grenfell).—This fallow was situated to the south of Grenfell, near Thuddungra. The paddock was level, and of light red loam soil typical of a considerable area of excellent wheat land in the locality.

It was mouldboard-ploughed 4 to 5 inches deep in July; harrowed in September; springtoothed in mid-October and December and again in third week in January; harrowed early in February, and springtoothed end of February. It was judged on 14th March.

The fallow contained plenty of moisture, and the mulch was excellent as regards degree of fineness, but a little too deep. The subsurface soil was of excellent consistency, but rather shallow, due to too deep a working with the springtooth. Except for an odd patch of couch, it was devoid of all weed growth. The headlands and finishes were a little too deep, otherwise the appearance and general working of implements were very thorough.

The complete control of Stink grass on this fallow, due to the timely cultivation in December, followed by continual stirring of the surface soil, may be regarded as its outstanding feature.

F. C. Rowlands and Sons (Cowra).—The winning fallow in this combined fallow and crop competition was situated at Waugoola, 16 miles from Cowra, on the Blayney road. The locality, which is higher than the town of Cowra, is more favoured as regards rainfall, &c.

The fallow was mouldboard-ploughed in September 5 inches deep; harrowed in October; springtoothed in January (first week); disced in the beginning of February; springtoothed and harrowed in the second week of March.

It was in an excellent condition, quite free from weed growth, holding almost all the moisture possible, and was very carefully worked. The surface of the mulch was in an ideal, small cloddy condition, and generally of correct depth, a variation in soil causing some irregularities. This variation affected compactness, which otherwise was of good consistency, and with excellent top. Generally speaking, it was a splendid fallow, the result of knowing what the requirements of a good fallow are and working the soil correctly so as to secure them.

F. Mulligan (Eugowra).—This block tied for first place with the block entered by Mr. W. J. Bradford. It was a level medium red loam soil, and adjoins Trajere Siding.

In August it was disc-ploughed 4 inches deep; combined in mid-November and at end of December; harrowed in January; springtoothed in March and again first week in April. It was stocked very heavily with sheep during the summer. It contained excellent moisture, and was very nicely mulched on top, with a slight variation in depth. The compacted area was somewhat uneven on top, but otherwise very good. Only an odd weed detracted from a fallow that was otherwise excellent in appearance, and which was worked on the right principles.

W. J. Bradford (Eugowra).—This fallow was situated on the north and opposite side of Eugowra to Mr. Mulligan's fallow, and was on a varying light red sandy loam, originally pine country. It was comparatively new ground, having been once previously cropped.

The fallow was mouldboard-ploughed 4 inches deep in August-September; springtoothed in January; harrowed at end of January; combined and harrowed in February; combined in March; and harrowed early in April. It had a fine mulch of even depth for the most part, and was nicely consolidated, the top being very level. It was slightly variable as regards moisture, due to soil variation. A few patches of couch were the only weed growth.

J. Caldwell (Molong).—This fallow was a strong red loam, the paddock having been cropped for many years.

It was combined twice in May; lightly mouldboard-ploughed in October and harrowed; combined in November; harrowed in January and February; combined in March and April with light harrows following.

It contained an excellent supply of moisture and nice depth of mulch, but somewhat too fine. It was quite devoid of weed growth. The subsurface soil was a little too compacted, but was of good depth.

J. Ward (Cranbury Bureau).—This block was an excellent light red loam soil which had not been ploughed at the commencement of this fallow. The cultural operations were: Springtooth cultivated and harrowed in February, 1927; springtoothed twice in September, and again in December; harrowed and springtoothed in January, 1928; twice springtoothed in February, and again in March and early April.

It contained almost all possible moisture, and was practically free from weed growth. The mulch, due to the numerous workings, was fine, but very even in depth. In compactness, the subsurface was very good, a little too consolidated in places, but generally of correct consistency. Headlands and finishes were not over-worked.

This fallow provides an interesting experiment in that the initial ploughing was eliminated and all work done, and done frequently, with springtooth cultivator and harrows.

Weed Control on Fallows.

The fallowing competitions in the Central-west this season have demonstrated in a particular way the impossibility of standardising fallow operations, the beneficial effects of early summer cultivations in controlling weed growth, and the damaging effect of heavy summer rains in causing fallow erosion.

It is evident that Stink grass (*Eragrostis major*) prevails throughout the central-west wheat district. Its damaging effect on fallows, particularly in dry times, and the subsequent serious depletion of wheat yields, are generally recognised, although there are some farmers who are content to live in a fool's paradise, and these refer to it as the "poor man's lucerne." While it has some feeding value in its very young stage, it is so quick in maturing that this period is too short to be worthy of consideration. In seasons when the weather during the summer months is continually showery, it is very difficult to cope with weed growth, particularly on some classes of soil. While sheep are indispensable on the fallows for checking most weeds, there is no doubt that in a summer such as that of 1927-28 they cannot be expected to keep down Stink grass. Generally, where this grass took charge of the fallows the disc cultivator was employed during March. Had the sowing season been dry, disastrous results would have been experienced from this practice. As it happened, the most favourable sowing season for many years was experienced, and this considerably nullified the effect of the weed.

In working the fallows for the destruction of summer weeds, the harrows are strongly recommended. Should the weed growth be too big for harrows, the rigid-tine type of implement with wide points is preferred. This implement is, beyond doubt, the best for working fallows, as not only

will it destroy weeds satisfactorily, but it promotes a more even distribution of moisture, a mulch of even thickness, and, most important of all, a level top to the compacted subsurface soil.

Soil Erosion.

In the undulating wheat areas of the district, wheat farmers are becoming alarmed at the extent to which soil erosion is taking place as a result of heavy summer rains. In the worst cases last summer acres of fallow were washed down to lower levels, leaving the subsoil bare; in others, big winding gutters, which are impossible to fill, were cut; while in the mildest cases numbers of gutters were cut which will have to be filled in with scoops or home-made levellers—a long and costly business.

The prevention of this erosion is a most difficult matter. It may be due, in a measure, to the loss of organic matter in the soil, and to a certain extent to the present-day methods of fallow cultivation. It would certainly seem advisable to consider the incorporation of organic matter in the soil by crop rotation, or by stimulating the growth of natural trefoils, &c., in the stubble and ploughing them in. It is advisable to modify cultivation methods somewhat—by having a mulch on the coarse side, for example.

A contributing cause of gutters on the fallows is, undoubtedly, the present-day practice of using big heavy implements (tractors, &c.,) to plough and cultivate round the paddocks, eventually ploughing out the "corners." This means that a considerable area of the paddock is ploughed in the direction of the natural flow of the water, thus providing gutters which are very soon washed out, particularly in the deeply-worked loose corners. Ploughing across the natural water flow should be adopted as far as practicable in these localities.

The Narrabri Competition.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

The fallow competition promoted by the Narrabri P. and A. Association attracted eight entries. The competitors were:—

W. T. McCutcheon, "Ceamaltha," Narrabri.
Messrs. Barrett and Orman, "Yera," Edgeroi.
A. Gett, "Glenville," Narrabri (two entries).
S. Carberry, "Cadarga," Culgoora (two entries).
V. Pilditch, "Kookaburragong," Narrabri (two entries)

Credit is due to the entrants for the condition of their fallows, in view of unfavourable weather which prevailed during the summer months. Excessive rains necessitated special attention in cultural operations in order to cope with excessive weed growth and maintain the necessary mulch. The use of mouldboard ploughs and rigid-tine scarifiers with wide feet would result in a more even depth of mulch and a better compaction of the subsurface soil.

RAINFALL Recorded at Narrabri.

1927.	Points.	1928.	Points.
June	205	January	90
July	7	February	1,297
August	70	March	544
September...	16	April	182
October	177	Total (1928)...	2,113
November	296		
December	666		
Total (1927)...	1,439		

The total rainfall from June, 1927, to April, 1928, was 3,552 points. It will be noted that an exceptionally large amount was recorded in February. This was purely local, and the average for that month on the fallows was approximately 5 inches.

The Awards.

Judging was carried out on 27th, 28th, and 29th April, 1928, and in some cases the mulch was too deep and the seed-bed too loose, considering that the planting period was close at hand when the judging was done. This condition, no doubt, was due to the excessive growth of weeds necessitating deeper working than is desirable.

The fallows were distributed over a large tract of country, and the soils ranged from heavy black to medium red loams.

AWARDS in the Narrabri Competition.

Position	Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total.
1	W. T. McCutcheon ...	34	31	31	34	8	138
2	Barrett and Orman ..	34	33	34	28	8	137
3	A. Gett (No. 1 entry) ...	33	30	34	30	9	136
4	S. Carberry (No. 1 entry)...	33	30	34	29	8	134
5	V. Pilditch (No. 1 entry) .	32	30	31	31	9	133
6	S. Carberry (No. 2 entry) .	33	29	32	27	8	129
7	V. Pilditch (No. 2 entry) .	30	29	31	28	8	126
8	A. Gett (No. 2 entry) ...	28	25	30	29	8	120

Notes on Leading Fallows.

Mr. W. T. McCutcheon's entry was in an old paddock which had been cropped since 1914. The last crop was wheat in 1926. The soil consisted of a dark clay loam, possessing a good type of subsoil 6 to 8 inches from the surface.

The land was ploughed with a disc plough in July, 1927, and continually stocked till December, when it was springtoothed. A further springtoothing was given in April. The fallow was stocked throughout the fallowing period, and the points scored under the heading of compactness were no doubt due to this.

Messrs. Barrett and Orman's entry was a medium dark loam with self-mulching tendencies. Ploughing was done with a disc plough in November, 1927; the rigid-tine was used in February and again in March. The fallow was harrowed twice in April. This fallow showed evidence of careful working of the mulch, being of good texture and uniform in depth. Points were lost under the heading of compactness, in which respect it was somewhat uneven.

Mr. A. Gett's entry was a medium red loam, the subsoil occurring at about 12 to 18 inches. The fallow scored well for moisture and cleanliness, but the mulch was deeper than is desirable.

The Ardlethan Competition.

K. G. CARN, Experimentalist.

The standard of the twenty-six entries in the Ardlethan and District P. and A. Society's district competition, particularly in view of the heavy rains in January, February, and March, is deserving of much praise. The leading fallows submitted showed evidence of thorough and careful working, resulting from sound thought and study of the principles of soil culture in relation to individual conditions.

Abnormal Rainfall.

The moisture content of the fallows was naturally very high, following the downpours in the summer, which caused many severe losses through scouring on farms where light undulating country had been fallowed. Rainfall was recorded on six farms, and a study of this abnormal fall indicates the difficulty experienced in awarding points for "moisture content," and only by investigating at depths of 18 and 24 inches could a distinction be made.

RAINFALL.

	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
T. P. Kenny... ...	45	148	76	56	333	73	99	406	604	300	152
W. R Randall ...	43	150	72	154	235	57	60	478	679	340	162
J. M. Stewart ...	42	173	109	100	354	107	15	382	839	366	134
Gemmell Bros. ...	45	158	99	170	247	75	68	444	724	387	159
P. J. Wilson... ...	53	128	104	112	305	68	117	325	586	226	259
S. A. S. Hodge ...	48	122	76	124	361	66	17	320	670	221	161

The mulch in the majority of cases was of a good standard and, with the exception of two entries, had been formed with tine implements. In cases where fallows were not cultivated, allowance had to be made for the condition of the soil, taking into consideration whether the land was past the proper working stage, and the progress of the cultivators.

In regard to the seed-bed, the soil in most cases was well compacted, being aided by heavy rain and the heavy stocking necessary to combat weed growth. The chief fault was the presence of corrugations in most of the seed-beds, due to the irregularity of the spring-tine cultivators.

The Awards.

The leading fallows were remarkably free from weeds, and displayed a wonderful triumph for the tine cultivators combined with heavy stocking of sheep when the weeds were in the young stages. Sheep this year have been a valuable asset to the farm, and it was pleasing to see that the Ardlethan district made full use of this side of mixed farming. Where weed growth becomes heavy the rigid-tine scarifier, fitted with wide points, will be found more satisfactory than disc implements, which place the fallow in just the opposite condition to that desired.

AWARDS in the Ardlethan Fallow Competition, 1927-28.

Competitor.	Moisture	Mulch.	Cleanliness.	Compactness	Condition.	Total.
S. A. S. Hodge (No. 1) ...	33	33	32	33	9	140
Carroll Bros.	33	32½	32	32½	9	139
Geo Maslin (No. 1)	33	32	33	32	8	138
J. Hawthorne (No. 1)	33	32	32	32	8	137
Gemmell Bros.	33	33	29	33½	8	136½
T. P. Kenny	32	31	31	34	8	136
J. Hawthorne (No. 2)	33	31	32	31	8	135
S. A. S Hodge (No. 2)... ...	33	30	31	32	9	135
Geo. Maslin (No. 3)	32	33	30	32	8	135
T. Baker	33	30	32	32	7	134
J. Hawthorne (No. 3)	33	30	31	32	8	134
Geo Maslin (No. 2)	33	31	31	32	7	134
M Stewart	33	32	30	32	7	134
W. R. Rendall	33	28	33	31	8	133
Ashwin and Gemmell	32	29	31	32	8½	132½
Gemmell and Bell	32	30	32	31	7	132
Geo Firth	31	30	32	30	8	131
Harrison and Gemmell... ...	32	30	30	32	7	131
H. Sheldrick	33	30	29	31	7	130
Gemmell and Bell	32	30	28	32	7	129
P. J. Wilson	33	30	27	32	7	129
C. M. Dobell	32	29	29	32	6	128
F. J. Stewart	32	28	26	32	8	126
F. A. Hawthorne	32	27	28	32	6½	125½
S. J. Allen	33	26	26	31	7	123
W. R. Allen	33	28	25	28	8	122

The Leading Fallows.

Mr. S. A. S. Hodge gained first place with an entry of long summer fallow, the area comprising 130 acres of light red loam. The land was disc cultivated in March. Ploughing was carried out in August with a skim plough, working at a depth of 3 to 3½ inches. In October the first cultivation was undertaken with a springtooth working at the ploughing depth. The paddock was harrowed in January, springtoothed in February-

~~March, and~~ "combined" in April. The fallow was heavily stocked throughout with sheep. This fallow was of a very high standard, and showed evidence of careful and thorough work. The mellow condition and humus content of the soil was a first-class example of the indirect profits to be obtained from rotating oats with wheat, a practice that holds a definite place in this exhibitor's cropping methods.

The second place was filled by an entry by Messrs. Carroll Bros. of 50 acres of light red soil, and was certainly a fine effort. This exhibit was winter fallowed, the initial working (mouldboard-ploughing at 3½ inches) being performed in July. Early in October the land was "combined" deeply. The combine was used again in January, March, and early April, and the land was springtoothed in the middle of April. The award points dropped on this fallow were chiefly due to a faulty springtooth leaving a slightly corrugated seed-bed; otherwise a very clean, attractive, and thoroughly worked fallow was presented.

The entry of Mr. George Maslin, which gained third place, consisted of long summer fallow on quite a different type of soil. The paddock consisted of 50 acres of stiff clay soil, and with the exception of a strip of the fallow cultivated with a faulty machine in the final working, the exhibit was certainly a credit to the owner. Following the disc cultivator in March, the land was mouldboard-ploughed in August, springtoothed in September to the full ploughing depth, springtoothed in January, March, and again in April. This fallow presented a good example of the advantages to be derived from long summer fallowing this class of soil, where ploughing in June is practically impossible.

Remarks.

Some of the land in the Ardlethan and surrounding district presents an ideal case for the long summer fallow, especially where a man possesses either a stiff clay soil or land badly infested with black oats, in which case he is strongly advised to place portion of his farm under this practice.

With regard to short summer fallow, although of particular importance where oats are grown following on wheat, the practice is not recommended for wheat culture in this district.

The Value of Milk.

On account of the amount of water in milk, it is often thought expensive by many who do not know its real food value. This is chiefly because it is in liquid form, and because it is often used as a beverage. Milk, however, has not as high a percentage of water as strawberries, turnips, tomatoes, oysters, and many other foods in solid form. About four-fifths of the human body is made up of water. Although milk contains such a high percentage of water, it is still an indispensable food, because its solids have all the food essentials which entitle milk and milk products to the main place in the diet of the young and of the old.—J. A. Ruddick, Dominion of Canada Department of Agriculture.

Seed *for* Summer Crops

EXPERTS and far-seeing farmers and graziers are bearing in mind the fact that a somewhat dry Spring and Summer may follow after the comparatively wet Autumn which has been experienced on the coast and tablelands. Therefore it would seem wise to make

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R.A.S. Field Maize Competitions.

Judge's Reports on South Coast Groups.

R. N. MAKIN, Senior Agricultural Instructor.*

Camden Group.

There were five entries in the Camden group of the Royal Agricultural Society's Field Maize Competition this year, one of which was withdrawn prior to the final inspection. Compared with last year the results were much better, due to a more favourable season.

The number of entries was disappointing, seeing that the Camden district can grow very fine maize, and farmers who grow it are finding it very profitable to feed to dairy cattle instead of marketing it. The varieties under test this season were well suited to the district.

The Season.

Weather conditions were not altogether favourable in the early stages of the growth, and weed control, up to the time of the first inspection, was not difficult, and it was evident at that time that satisfactory attention had been given to the matter, as there was every indication of frequent cultivation. At the end of March the heavy rain was responsible for a small loss from stems falling, this being more noticeable in the Funk's Yellow Dent plots, due to the fact of the stem being finer, and also on account of its early maturity.

Results of the Judging.

The points awarded in the two inspections are as follows:—

Competitor	Cultivation (Max. 25 points).	Germination (Max. 10 points).	Condition and general appearance (Max. 10 points).	Freedom from Pests and diseases (Max. 10 points).	Purity and Trueness to type (Max. 15 points).	Estimated yield (3 points for every 10 bushels)	Totals.
J. Bruchhauser...	24	9	9	9	14	34	99
Camden Park Estate (No. 1)...	24	9	9	7	14	30	93
Camden Park Estate (No. 2)...	24	9	8	9	13	28½	91½
Camden Park Estate (No. 3)...	24	9	9	7	14	25½	88½

The winner of this group was Mr. Bruchhauser, who entered portion of a 5-acre plot of Fitzroy. It was a very fine stand of corn, and received very careful attention. At one time the land was under fruit trees. It has now been under cultivation for cropping for six years, the previous crop being maize. It was planted the second week in October, 1927, in rows 4 feet apart. The land, being a medium loam, works up well. A dressing

* Mr. Makin judged all three groups in the South Coast section of this competition.

of superphosphate (2 cwt. per acre) was applied. The grain was a nice bright sample, showing very good quality.

The Camden Park plots gave good returns. No. 3 plot (Fitzroy) was disappointing, a better class of seed being required. Plots Nos. 1 and 2 (Funk's Yellow Dent) were satisfactory, yielding up to 100 bushels per acre. The cobs were generally well filled on top and butts, and carried good quality grain. All plots received careful cultivation. The soil was a black loam formed from alluvial deposits, and has been under cultivation for approximately a hundred years. Superphosphate at the rate of 1 cwt. per acre was distributed broadcast.

Other than evidence of a little root rot there was nothing to complain about as regards the ravages of disease.

Kangaroo Valley Group.

In all there were sixteen entries in this group, and of these three were withdrawn before the final judging.

Results of the Judging.

The points awarded are as follows:—

Competitor	Cultivation (Max. 25 points).	Germination (Max. 10 points).	Condition and general appearance (Max. 10 points).	Freedom from Pests and diseases (Max. 10 points).	Purity and Trueness to type (Max. 15 points).	Estimated yield (3 points for every 10 bushels).	Totals.
A. R. Parish ...	24	9	9	9	12	33	96
J. Keenan ...	24	9	9	9	12	32	95
F. W. Madge ...	23	9	8	9	11	33	93
J. Chittick ...	20	9	8	8	14	33	92
J. W. Lidbettor...	24	9	9	8	12	27	89
J. Graham ...	24	8	9	8	14	25½	88½
P. Clempson ...	22	9	8	8	14	25½	86½
T. H. Nelson ...	22	8	8	8	13	27	86
H. O. Cox (1) ...	24	9	9	6	12	22¾	82¾
H. O. Cox (2) ...	20	9	8	8	14	22½	81½
M. P. Brennan ...	24	9	8	9	12	18	80
D. A. Nelson ...	21	8	8	7	7	27	78
Williams Bros. ...	20	8	8	7	12	21¾	76¾

The Plots.

The plots throughout were a good lot, and for the most part were well kept, although it is considered there could have been a better finishing, especially on the headlands—a matter which would incur only a little extra trouble. Most of the plots were uniform, showing very little variation as far as soil conditions were concerned.

Several plots were planted by means of the hoe—a slower process, but generally assuring an excellent stand. In the machine-planted crops there was an occasional "miss," but this can be overcome in future by grading the seed before sowing. An easy method of doing this is to run the seed through the maize planter by jacking up the back wheel, and then putting the seed through by turning the wheel by hand.

There was evidence of the need of better selection as regards seed purity, there being a good deal of difference in some Hickory King plots, and Cox's Yellow showed much variation in a couple of plots.

In regard to disease there was evidence in all plots of root and stem disease, more or less, and in some cases smut was accountable for a decreased yield.

The Winning Crop.

The plot gaining the greatest number of points—Mr. Parish's—was grown on a medium loam which had been under cultivation for three years, the previous crop being maize. The land was ploughed 7 inches deep in August, 1927, and then well harrowed twice. It was planted on 1st October by means of the hoe, the variety being Cox's Yellow. No fertiliser was used. The crop in its early stages of growth was scuffled twice, and the hoe was used regularly in checking weed growth.

Another plot that calls for comment is that of Mr. M. P. Brennan, who must be admired for his efforts under most exacting conditions. His plot was situated on very steep country on the side of Barrengarry Mountain, and was practically worked throughout by hand.

Bega Group.

In the Bega district the Agricultural Association was successful in obtaining six entries in the competition, but two of these were withdrawn before the second inspection. The bad weather conditions early in the season were probably responsible for keeping some growers from competing. Bega district is well known as a maize-growing centre, but of late there has not been the same attention given to grain production as in years past because dairy farming has proved more profitable. In recent years, however, it has been shown that it is profitable to feed maize grain to milking cows, and this practice promises to become general. In most cases the whole of the cob is ground up and fed along with chaffed green fodder or silage.

The Winning Entries.

The crops submitted for the final judging were grown on two well-known farm properties, viz., Warragaburra, owned by Mr. J. D'Arcy, and the Wood Estate, Yarramung, portion of which is being worked by Mr. S. Piper. Two entries were received from each farm.

AWARDS in the Bega Competition.

Competitor.	Cultivation (Max. 25 points).	Germination (Max. 10 points).	Condition and general appearance (Max. 10 points).	Freedom from Pests and diseases (Max. 10 points).	Purity and Trueness to type (Max. 15 points).	Estimated yield per acre (3 points for every 10 bushels).	Totals.
J. D'Arcy (1) ...	24	9	9	9	12	$35\frac{3}{5}$	$98\frac{3}{5}$
J. D'Arcy (2) ...	24	9	9	9	12	33	96
S. Piper (1) ...	24	9	9	9	10	27	88
S. Piper (2) ...	24	9	9	9	10	$22\frac{1}{2}$	$83\frac{1}{2}$

It was unfortunate that all these plots were under flood waters, more or less, during April, and suffered in yield thereby. At the time of the first inspection (in February) the plots were in excellent order, there being little fault to find with the cultivation and stand. At the second inspection it could be seen that the yield was going to be better than anticipated. Other than mould on cobs which were near the ground, and some root and stalk rot, there was not much loss from diseases, but as regards purity there was evidence of pollen having been introduced by some means from other varieties.

Varieties Grown on Leading Plots.

Mr. D'Arcy chose Funk's Yellow Dent for his plots, and it presented a fine sight when inspected for the first time in February. It is a variety which does well in the district, and is well liked by those who prefer a fairly early maturing variety.

Mr. Piper chose Mastodon, a variety well-known in the district, but it is now difficult to get a really pure strain of this variety on the South Coast. Mr. Piper's crop showed a fair amount of variation, but it produced good cobs carrying good grain. Mastodon is preferred by this grower, as he considers it better able to withstand flood waters than most varieties.

STORING SWEET POTATOES.

REPLYING to an inquiry from a Richmond River farmer, who was concerned as to the keeping qualities of a crop of sweet potatoes that he had just harvested, Mr. J. Douglass, Agricultural Instructor, supplied the following information:—

The keeping quality of sweet potatoes is governed by the following factors:—

Season.—This season, generally speaking, was one in which potatoes of good keeping quality were not produced. A good rainfall produces rapid sappy growth, and under such conditions the roots in low localities rot very readily.

Condition of Tubers.—When dug and taken to the barn the tubers should be sorted, all damaged or immature tubers being placed on one side for stock fodder.

Varieties.—Long white varieties, such as White Maltese, break up readily and are bad keepers. Generally, the pink varieties are the best keepers. The Department of Agriculture has some new varieties at Grafton Experiment Farm, several of which are excellent keepers. The best are Southern Queen, Yellow Strassburg, and Nancy Hall.

Method of Storing.—When grown and left unharvested in very light sandy loams that are well elevated and drained, it is found that sweet potatoes keep well. They should be examined occasionally by lifting a few plants with the object of observing their keeping quality. If taken to a barn to store, the roots should be thoroughly dry, and, if convenient, covered with dry sand. This is only necessary when it is intended that the tubers should be kept for some time.

It might be mentioned that all classes of stock like sweet potatoes; therefore, any waste material should be fed to stock before it decays.

Rice-growing Competition.

Yanco Irrigation Area, Season 1927-28.

H. J. DARGIN, Agricultural Instructor, and G. G. St. CLAIR POTTS, H.D.A., H.D.D., Land Settlement Inspector.

The competition was for the Cup presented by the Rice Millers' Association, and was held under the auspices of the Yanco Area Agricultural Society. Judging was carried out under ideal weather conditions just prior to harvesting operations being commenced, this being considered the most favourable time.

From nineteen original entries, each of 25 acres in one block, eighteen were submitted to the judges; one having been withdrawn from the competition on account of damage caused by hail. The entries as a whole represented crops above the average for the district in past years, and the evenness, together with heavy yields, indicated particular attention to land preparation and construction of check banks sufficiently large to control irrigation at a minimum expense and to enable effective submergence; the latter factor being largely responsible for the heavy yields obtained by a large number of exhibitors. In almost every instance where deep submergence had been practised the resultant crop was more even and ripened in a more uniform manner.

During the tour of inspection an outstanding factor was the prevalence of red rice and its variants, and the reversion from type in the early maturing variety Colusa—not only in all the competition crops, but also without exception in all other crops of this variety seen throughout the district. Too much importance cannot be attached to this regrettable position, and the judges are of the opinion that this variety should be eliminated from next season's bulk sowings.

As the successful cultivation of rice depends largely upon an abundant supply of water, the judges paid a great deal of attention to the construction of efficient check banks essential to the maintenance of satisfactory water levels. The importance of this phase of rice culture is obvious, for not only do strong check banks allow of efficient control but also reduce the labour connected with the irrigation to a minimum, resulting in a greater net profit per acre.

Various methods of irrigation and drainage control were adopted, most of which were more or less efficient, but those applied on Mr. Tooth's farm are worthy of special mention, and settlers would be well advised to inspect the system in operation there with a view to adopting them on their own properties.

The season was characterised by abnormal summer rains with consequent high humidity, ideal for rice culture, and in consequence heavy average yields will be obtained this season throughout the Irrigation Areas.

In several cases where faithful preparation of the soil had been carried out—early ploughing and subsequent cultivation—the germination, stooling, evenness and ripening of the crop, and resulting yields were pronounced. It is therefore apparent that rice, under conditions prevailing on the Murrumbidgee Irrigation Areas, responds just as well as any other crop to efficient cultural practice.

Although the majority of crops judged had been satisfactorily ripened in water, the advantages of which were evidenced in the samples of grain, there were instances where the water had been drained off too early, resulting in an uneven ripening and sun-cracking of the grain, and in consequence delayed harvesting.

YANCO Rice-growing Competition.

Name and address of Competitor.	Variety.	Rate of sowing per acre.	Points Awarded.					
			Preparation of land (including seed-bed, and facilities for irrigation control and drainage). Max. 50.	Freedom from weeds.* Max. 24–26.	Condition, appearance and evenness of crop. Max. 25.	Sample sheaf at Leeton Show, 1928. Max. 10.	Apparent yield. One point for each bushel of apparent yield	Total
		lb.						
C. H. Young, Farm 1461, Murrami (Entry No. 2) ...	Caloro	110	45	23	25	10	165	268
C. H. Young, Farm 1461, Murrami (Entry No. 1) ...	,,	90	45	23	24	10	160	262
C. H. Young, Farm 1448, Murrami (Entry No. 3) ...	,,	110	45	23	24	10	160	262
Pannowitz, Farm 919, Whitton	,,	100	42	23	22	10	160	257
H. L. Tooth, Farm 1081, Murrami	,,	100	44	22	22	10	155	253
A. D. Mackellar, Farm 373, Wamoon (Entry No. 1) ...	,,	100	41	19	23	10	160	253
A. D. Mackellar, Farm 382, Wamoon (Entry No. 2) ...	,,	100	42	20	22	10	155	249
Houghton Bros., Farm 918 ...	,,	100	42	20	19	...	160	241
G. H. Blencowe, Farm 291, Yanco (Entry No. 1) ...	Colusa	100	42	23	20	10	140	235
G. H. Blencowe, Farm 291, Yanco (Entry No. 2) ...	,,	100	42	23	20	10	140	235
E. L. M. Facer, Farm 955, Whitton	Caloro	100	40	19	19	10	145	233
S. J. Grigg, Farm 221, Leeton...	,,	100	35	22	20	10	145	232
T. W. Airey, Farm 855, Whitton	,,	100	35	17	18	10	130	210
A. V. L'Green, Farm 1428, Murrami (Entry No. 3) ...	,,	90	40	16	19	10	120	205
A. V. L'Green, Farm 1428, Murrami (Entry No. 2) ...	,,	90	40	18	17	10	115	200
D. T. Hughes, Farm 1040, Murrami	,,	75	44	20	18	10	90	182
A. V. L'Green, Farm 1428, Murrami (Entry No. 1) ...	Colusa	80	44	14	15	10	75	158

* All entries were grown on land producing rice for the first time, entitling them to a maximum of 24 points.

On virgin land the crops were all free from weed growth (except for a little "cumbungee" in a few cases), whilst on land other than virgin, where the control of weeds was certainly more difficult—particularly on dairy farms and areas used for grazing large stock—the efforts put forward by competitors were in most cases very creditable and successful.

The Winning Crops.

The winning crops, entered by Mr. C. H. Young, of Murrami, were grown from Caloro seed supplied by Mr. H. L. Tooth (winner of the Cup last season). The crops in question were outstanding in regard to evenness, density and cleanness. The check banks were particularly good, enabling effective deep submergence throughout the growing season. As a result the crop ripened very evenly, and the sample of grain was all that could be desired. In fact, the same remarks in regard to seed quality apply to the eight crops placed in the lead of the competition.

Mr. Young's entries Nos. 1 and 2 were grown on similar virgin land, which received the same treatment throughout, though the quantity of seed per acre differed, the winning crop being sown at the rate of 110 lb. per acre and the dividing second crop at the rate of 90 lb. per acre. Entry No. 3 was sown in different soil on another farm at the same rate as the winning crop, but the land had previously been used for cereal cropping.

From observations made it would appear that seeding at the rate of 100 lb. per acre for virgin land as recommended by the Department of Agriculture and the Water Conservation and Irrigation Commission, should be adhered to.

In conclusion, it is pointed out that as a number of the rice crops grown this season on old rice and cultivation land were badly affected with water grasses—mainly Barnyard grass (*Panicum colonun* and *P. grus-galli*)—intending growers should seriously consider obtaining pure seed from a reliable source.

What Should not be Expected of Liming.

Liming will not take the place of drainage. Acid soil conditions may be due to poor drainage, but lime can improve only the conditions in the upper soil, making for better circulation of air and water. Impervious layers of hardpan are not materially affected by applications of lime, but should be broken up by other means.

Liming cannot take the place of proper crop rotation, cultivation, or soil management. In fact, the use of lime makes it more necessary that rotation and all cultural methods be studied more carefully.

Lime does not supply any of the constituent elements furnished by fertilisers—potash, phosphoric acid, or ammonia.

Best results should not be expected from an application of lime on soil deficient in organic matter, and liming should not be expected to build up such a soil unless such organic matter is supplied either in manure or green crops ploughed in.—Edmund C. Shorey, Bureau of Chemistry and Soils, U.S.A. Department of Agriculture.

Score Card for Sugar Cane Competitions.

L. S. HARRISON, Special Agricultural Instructor.

A SCORE card for use in judging field sugar-cane competitions is set out hereunder, and whilst these competitions have many points in common with other field crop competitions, it can also be understood that sugar-cane has distinct features peculiar only to a product that takes the best part of two years to mature, and which is then sold on its relative constituent value rather than on the gross weight or bulk harvested. In the scale, due regard is given to the desirability of so balancing the points that essential requirements are allowed for without permitting them to unduly influence the total.

SCALE of Points.

	Points.
1. Cleanliness of cultivation, and cultivation ...	20
2. Evenness of stand, and lack of patchiness ...	20
3. Stooling ...	10
4. Freedom from disease (Mosaic and Fiji) ...	15
5. Freedom from lodging...	10
6. Estimated yield per acre to nearest 5 tons; stalk samples to determine P.O.C.S. (percentage obtainable cane sugar); then calculate value per acre, less 10s. per ton to cover cutting and hauling...2 points for each £7 10s. value.	

NOTE.—Nos. 1 to 4 to be judged about March following planting; Nos. 5 and 6 to be judged about eighteen months later.

The awarding of points under the first three items does not require explanation. No. 4 makes no reference to gumming disease as this trouble is practically outside the grower's control, but Mosaic and Fiji diseases can be controlled. In regard to No. 6, it may be explained that as the price based on sugar content is fixed to the grower, it is necessary to allot points on the basis of value, since, at 10s. per ton for cutting and hauling, it would cost £40 to harvest a crop yielding 80 tons per acre, and £30 for one yielding 60 tons, with the great probability that the P.O.C.S. from the 60-ton crop would be higher per ton than from the 80-ton crop.

These points were definitely drawn up for use on the Richmond River, and, as in other cases, it may be found necessary to modify them as occasion suggests. The varieties are limited to Malabar, and, on approved areas, HQ5. These are to be judged separately, an area of 2 acres to be submitted, and no grower is to be allowed to enter more than one block of each variety, which must be plant cane only.

The Broadwater Branch of the Agricultural Bureau has been the first to move in the matter of field sugar-cane competitions, and entries for their first competition must be in before the end of February, 1929. This branch is to be congratulated on recognising the educational value of these competitions, and doubtless sugar-cane as a crop will benefit by reason of these field competitions in much the same way as other crops, and Broadwater's example might well be followed by other cane-growing districts.

Field Technique in Cereal Breeding in New South Wales.

J. T. PRIDHAM, H.D.A., Plant Breeder.

In a previous article (November, 1927) an account of the methods leading to the production of pedigree seed at Cowra Experiment Farm was given. It is now the intention to give a more detailed description of the technique and conduct of the field work in the breeding and selection of cereals.

The Introduction Block.

A separate block or area of land is reserved each year for planting new introductions, head selections, and F1 and F2 crossbred seed. These seeds are sown in 10-link rows, and in the case of F2 crossbred seed, several rows are sown. With new introductions, of which nothing much is known, only a short row is planted the first year, and if the variety shows some desirable characters or variations more of the seed is sown the following year. This row is also under observation for the possible detection and control of new diseases, despite the fact that the seed has been treated before sowing.

Head selections are usually obtained as variants or outstanding types from farm crops by Agricultural Instructors and farmers who are encouraged to send anything of note in this way to the plant breeder. A short row sown with seed from this head indicates whether it has any outstanding features or variations which are worth persevering with.

These head selections and introduced varieties are given an accession number in the plant breeder's accession register, and, if uniform, selected plants and bulk seed are harvested with the same accession number. If, however, rogues or variants occur, these selected plants are given a new accession number, unless the row appears to be an unfixed crossbred, in which case it is treated as such, this being indicated on the packets of seed of the selected plants, such plants being designated A, B, C, &c.

In this area (Block 1), the seeds are sown singly, approximately 4 inches apart, in rows which are 2 links apart. Here and there through this block, rows of a standard variety or varieties are sown to indicate the maturity of the introduced varieties, which, with other observations, gives an idea of the group in which they shall be planted in the next block. No yields are taken in this block, but selected plants are taken for planting in the next block and for despatching to other experiment farms, and the remainder of the row is harvested as selected bulk seed if it is uniform and if it is desired.

Selected Plants.

Block 2 consists of 30-link rows sown in groups according to the purpose and maturity of the group, with alternate check rows of a standard variety for comparison. This block consists of plant selections of varieties from

Block 1 and elsewhere, and of F3, F4, F5, &c., crossbred seed. Selected plants of any variety which vary from the standard type are given a new accession number (unless as previously mentioned the wheat appears to be an unfixed crossbred). In this block, the seeds are also sown singly about 4 inches apart in rows 2 links apart. No yields are taken, plants being selected at harvest and the remainder of the row harvested as selected bulk seed.

Elimination is done by visual comparison with the adjacent standard check row, and selected plants are placed next year in the group to which they better belong. In the case of unfixed crossbreds, plants are chiefly selected for continuance in this block by the same comparison. An early sorting-out of types selected with a specific object and from a direct comparison with the group standard, enables families to be sorted out with a more definite chance of specifically obtaining a fixed variety which either compares well with the standard or is rejected at once. No selected bulk seed is harvested, of course, in the case of unfixed crossbreds.

With oats, at certain experiment farms, where the conditions favour natural crossing, three rows of variety are sown together from the same selected plant, selected bulk seed being harvested only from the middle row.

Triplicate Rows.

Block 3 consists of three ½-chain rows sown in groups as in the previous block, alternately with check rows of the standard variety for comparison. Selected bulk seed harvested from Block 2 is used for sowing these triplicate rows, which are 2 links apart, as in the other blocks, but the seed is dropped about an inch or two apart in the rows to make more certain of securing a good germination to make the yields more truly comparable. Nothing is so upsetting to the value of the data obtainable from the yields of such short rows as a poor germination. Some workers attempt to secure comparative results in the case of poor germination by dividing the yield of the rows by the number of plants in the row giving the yield per plant, but this is obviously absurd. Where yields are to be taken, it is considered far better to sow thickly as mentioned, than to sow single grains 4 inches apart as in the previous blocks, where the main consideration is selection of individual plants and elimination by observation.

Yields are taken according to the purpose of the group—grain, hay or green fodder. In the case of the last two group objectives, the yields are taken from the two outside rows, leaving the centre row available for seed production. The seed harvested from this block is called selected stock seed.

Crossbreds are kept in Block 2 until apparently fixed. When they are apparently fixed there, selected bulk seed is harvested and sown in Block 3. At this stage each strain of the crossbred is given an accession number, and the same accession number is given to selected plants of these strains, which are carried on in Block 2 as fixed varieties under this number but still under the nomenclature of the crossbred.

Elimination of the varieties and fixed crossbreds from Block 3 takes place by percentage yield data over a number of years. The percentage yield is obtained by dividing the actual yield of the variety by the average yield of the adjacent check rows of the standard variety and multiplying by 100. Varieties and fixed crossbreds which survive this elimination are carried on to the wide stud rows for increase of seed, as described in the previous article. At this stage, the fixed crossbreds which survive are definitely named, the accession number previously given to the particular strain serving and being allowed to stand. This elimination or rejection before the wide stud rows are reached ensures that only a few of the most promising varieties are carried on, and only the best fixed strain or strains of the crossbreds are named.

The selected stock seed harvested from Block 3 is sown in wide stud rows for the production of stud seed. At this stage it leaves the plant breeder's hands. From ½ bushel to 2 bushels of this stud seed is handed over to the Experimentalist or the Farm Manager for variety testing on a field scale and for raising stud bulk seed, which is then sown to produce pedigree seed for distribution and sale.

Summary of Stages in Development.

The stages in the development of a fixed variety from a crossbred would be much as follows:—

1st Year.—F1 seed sown in 10-link row in Block 1.

2nd Year.—F2 seed, mass selected, sown in several 10-link rows in Block 1.

3rd Year.—F3 seed of selected plants assigned to one or more groups and sown in 30-link rows, in Block 2.

4th Year.—F4 seed of selected plants sown as the previous year.

5th Year.—F5 seed of selected plants sown as before; becoming fixed.

6th Year.—If apparently fixed, selected bulk seed is sown in triplicate for yield test (50-link rows) in Block 3.

7th Year.—Selected stock seed sown in wide rows producing stud seed.

8th Year.—Stud seed handed to Experimentalist or Farm Manager for field variety tests and for raising stud bulk seed.

9th Year.—Stud bulk seed sown for raising pedigree seed for distribution or sale to farmers.

Field Observations and Notes.

The character of the early growth is a good indication of the season of the variety. If erect and sparse it almost invariably ripens early, and if leaves are abundant and prostrate late maturity is the rule. The date of heading is very important as affording a guide to the grouping of the variety for accurate comparisons. This is a safer index than the date of ripening, for at the latter stage maturity is often unduly hastened by early hot weather. Soon after the heading stage the suitability for hay is noted, damage by frost or cold winds and the incidence of diseases. About the time of ripening the height of straw and liability to lodging and stem rust

are noted. Field defects such as shattering, tip-withering (an indication of susceptibility to drought), and straw weakness are watched for, and fixity or unfixity of type is recorded.

Discretion is exercised in regard to diseased plants; those affected with loose smut and bunt are removed. Plants partially affected with foot-rot are not removed; if much of this disease is seen, diseased stalks are pulled out and the remaining healthy ones harvested. This also applies to flag smut, which occurs in a partial or sporadic fashion.

Detailed Nomenclature Records.

In the case of new or introduced varieties which reach the stage of being recommended for further field trial or for distribution, complete detailed nomenclature records are taken, which cover all the observable characters of the variety. These are chiefly as follows:—

In the young stages of growth, notes are taken of stooling habit, colour of young leaves and comparative breadth of leaves. At the heading stage, the date of ears peeping, comparative erectness of leaf, comparative amount of flag, suitability for hay and comparative susceptibility to diseases, are taken. When ripe, notes on the date ripe, comparative final stooling and compactness of habit, comparative height and lodging, colour, solidness, thickness, toughness and stoutness of straw, stem rust, bunt, erectness of ear, awnedness, comparative shattering, uniformity of type and drought resistance (tip withering) are taken.

Threshing notes include comparative length of ear, compactness, shape, sterility or base spikelets and colour of glumes or "chaff," comparative length or stoutness of awns, and their regularity, inclination and colour; also the regularity and comparative width of the spikelets, uniformity of colour and number of grains per spikelet, the comparative firmness of attachment of the glumes, comparative height and hairiness of the glumes, the breadth and nature of the keel and point of the glumes.

Notes on the grain include the comparative size, shape, colour, consistency (hardness), depth and width of crease and ease of threshing.

These records are supplemented by notes on the soil and season and the apparent suitability of the variety to the district where grown.

Yield and other Records.

Besides the field notes and observations and the detailed nomenclature records, which are only taken on the standard varieties which survive the elimination as the result of the triplicate row yield tests, the most important records are the yields. These are taken on cards for the sake of convenience in assessing the value of the variety in comparison with the group standard. The cards are set out to record the following headings:—Variety, accession number, farm, year, group, standard variety, important observations on growth, and percentage yield.

Further record cards are kept in alphabetical order with the economic notes on each variety, though in the case of some varieties where the circumstances naturally do not warrant it, these records are not filled in

entirely, a note being made that the variety was tested in such and such a year and was entirely rejected (it being understood that the variety had no redeeming or useful features). These record cards not only indicate what varieties have ever been tested, but form a helpful guide in planning further crossing. The information recorded is as follows:—Variety; source of origin; breeding; season (or maturing period); main use or purpose; class of grain (or type); susceptibility or resistance to diseases; main characters or qualities of use in breeding; defects; districts or soil conditions most suitable.

Sowing and Cultivation.

Until the wide row stage is reached the seeding is done by hand, and for individual plant selection single seeds are dropped about 4 inches apart with 2 links between the rows, as already mentioned. If the soil is well prepared the germination is usually good, the seed being from hand-threshed selected plants, and therefore of good vitality. The sections are measured off for 10-, 30-, or 50-link rows with pathways 3 to 4 links wide between them. Using a surveyor's chain, a temporary peg is put in at every fourth link, and shallow furrows opened with a wheel hoe. When two furrows are opened the land between is split with a third furrow. At four links' distance, another furrow is run out, and the intervening ground split on returning. Sowing and opening drills go on simultaneously, as far as possible, so that the soil does not dry out. The seed is covered by running the wheel hoe, fitted with weed knives which fill in the furrows leaving the ground fairly level, over the drills. The beds or blocks are numbered and given a distinguishing letter, and it is convenient to have a light iron peg at every tenth row painted with letter and number.

Cultivating and weeding are done with cultivator attachments to the wheel hoe, the single wheel implement being more serviceable than the double. A clipping hoe is not often required. The drilled plots are cleaned with a two-horse Planet Jr. cultivator.

Harvesting.

The wide rows are stripped with the special small header described in the previous article, the grain and chaff being bagged, and, when harvesting is finished, cleaned with a blower or fanning mill without sieves.

The hand sowings are reaped, selected plants being first cut and tied together with a label giving the row letter and number with the date of harvesting. They are cut with about 18 inches of straw, and a bunch of these small bundles is tied together and hung, heads downward, in a seed room until threshed. The remainder of the rows are cut and tied into sheaves, each being labelled and tied to a stake at the head of the row or to a netting fence bordering the paddock. Check rows are stooked together in the field.

Threshing and Storing Grain.

The single sheaves are weighed and then threshed by the small header before mentioned, the machine being shifted about to the different stooks,

and sheaves in the vicinity being carried to it. A large galvanised-iron grain box is used for the wide-spaced rows, and a small size for convenient handling and cleaning used for single sheaves. The latter are dealt with in half the time that would be required to flail in a bag. The mixture of chaff and grain is put into calico or hessian bags and these are cleaned later by pouring into a basin in front of the blower which separates the chaff. The grain is then weighed, a label being put inside and another outside the bag, which is tied with twine; the bags are of about uniform weight.

The grain is stored in large iron boxes or in petrol tins (4-gallon) fitted with lids. The stud seed harvested from the wide rows is kept loose in petrol tins and selected plants are kept in paper envelopes in the tins with naphthalene to prevent weevil infestation. Dusting with copper carbonate is effective in keeping loose grain free from insects. Seed in calico bags is stored in large tins alphabetically, viz., A to E; F to K; L to Q; R to Z.

Single plants are threshed by enclosing in a calico bag and beating on a smooth block of wood. The contents are emptied into a small dish and the chaff blown away. The grain is put into a small seed envelope bearing the number of the row and the year, as well as the name of variety and the group to which it belongs or in which it is to be sown. This is indicated by the field notes (including the date of heading) which are available from the field book which is always kept at hand at threshing time.

Tomatoes Under Vita Glass.

During last season experiments were carried out at Bathurst Experiment Farm to compare the relative merits of "Vita glass" and plain glass in the raising of tomato plants. Some time before the plants were transplanted into the frames, temperature readings were made under both kinds of glass, and the readings recorded under the "Vita glass" were considerably higher than those under plain glass. As a matter of fact, even after the "Vita glass" was covered with cheesecloth the temperature was still appreciably higher than under the plain glass.

Six tomato plants (Norton variety) were transplanted into each of the frames—one was covered with "Vita glass" and the other with plain glass—on 6th January. Portion of each frame was covered with cheesecloth which was placed over the glass, the remainder being open to the sun.

Early in February there were only two plants left in the "Vita glass" frame, one of which was under the cheesecloth-shaded half of the frame. Under the ordinary glass four plants grew, and they were quite normal, whilst those under the "Vita glass" were scorched and shrivelled at the tops. On examination it was found that the roots of these plants were quite normal and healthy, the shrivelling being due to the excessive heat.

Late in February the plants under the "Vita glass" were still showing the ill-effects of the heat. The plants under the plain glass were normal. From this it would appear that the "Vita glass" does trap more of the heat rays than plain glass, and would possibly be of great use in winter glass-houses.—R. Thomson, Experimentalist, Bathurst Experiment Farm.

Tomato Experiments, 1927-28.

Trials Conducted at Bathurst Experiment Farm.

R. THOMSON, Experimentalist, Bathurst Experiment Farm.

TOMATO growing in the Bathurst district has expanded greatly during the past few seasons. This has been due largely to the establishment of local pulping factories, and also to the fact that fruit of a superior quality can be produced in the district at a time when the coastal tomatoes are very watery and subject to disease. Quite a large proportion of the new area devoted to tomatoes is on upland country, and this led to the carrying out of trials under dry farming conditions in addition to the usual trials on irrigated land. During the 1927-28 season variety trials, both on irrigated and non-irrigated land; fertiliser trials, irrigated and non-irrigated; and plant-raising trials were undertaken at Bathurst farm.

Variety Trials on Irrigated Land.

The trials under irrigation were carried out on a block that had previously been an apple nursery. The remaining apple seedlings were grubbed out early in the winter of 1927, and the land ploughed early in August and again on 24th August and 26th September, and cultivated on 28th October and 8th November. The soil was a granite loam overlying clay, and was in good tilth at time of planting out.

The seed was sown in boxes in a frame on 29th August. Germination was good, but growth was slow. Bacterial spot (*B. vesicatorium*) occurred in the John Baer x Earliana variety on 12th October, and the box was removed from the frame. Just before planting out a few of the Bonny Best seedlings developed the disease. Late in October the frame was left open at night to harden off the plants. Planting out took place on 10th November with two rows of each variety. The rows were 4 feet 6 inches apart, and the plants 4 feet apart in the rows. Each plot was $\frac{1}{40}$ acre.

Furrows were struck out and watered immediately before planting. The plants were dibbled in, covered with paper, and watered immediately afterwards. The weather was hot and dry, and another watering was given two days later. A good take resulted with all varieties. Growth was good, strong vigorous vines being produced. Fruit set well, and was of very good quality during the early part of the season. Heavy rains during February and March made the fruit very soft and tender. The first fruit was harvested on 18th January, and the last on 19th April.

The rainy summer favoured disease, bacterial spot being present in all varieties, especially John Baer x Earliana. Spotted wilt was general,

although not very bad. Late in the season all varieties were affected with Irish blight, particularly on the fruit. Yields were as follows:—

Varieties in Order of Merit.	Yield per acre.			
	tons.	cwt.	qrs.	lb.
Bonny Best	6	13	1	8
Norton	6	11	0	16
Chalk's Early Jewel	6	8	2	8
Norduke	6	0	0	24
Earliana (Moore's)	2	15	1	4
Marglobe	2	0	0	8
Santa Clara Canner	1	15	0	11
John Baer x Earliana	0	18	0	0

Variety Trials on Non-irrigated Land.

The non-irrigated plots were grown on an old lucerne area. The land was ploughed on 13th August, springtoothed 16th August, cross-ploughed 14th October, and springtoothed again just before planting. The soil was a granite loam overlying clay, typical of much of the upland country of the district. Seedlings for the variety trial were raised in boxes in a frame. Seed was sown on 29th August, and the plants were hardened off early in November prior to transplanting. They were planted out on 11th November, in rows 4 feet 6 inches apart, and the plants 4 feet apart in the rows; plots three rows ($\frac{1}{50}$ acre) each. The land was in excellent order and very moist. The plants were dibbled in and watered with a can. Rain fell two days later, followed by warm dry weather.

A good stand resulted and growth was good and rapid. Fruit set well and was of good quality, except very late in the season during the rainy weather. The first fruit was picked on 6th February and the last on 17th April.

Bacterial spot was present in all varieties, but particularly in John Baer x Earliana and Bonny Best. A little bronze wilt appeared in all varieties, and Irish blight showed up late in the season. The yields were as follows:—

Varieties in Order of Merit.	Yield per acre			
	tons.	cwt.	qrs.	lb.
Norduke	2	9	2	6
Norton	2	5	1	20
Marglobe	1	19	1	27
Chalk's Early Jewel	1	16	3	14
Money Maker	1	2	1	2
Bonny Best	1	0	2	0*
John Baer x Earliana	0	2	1	0*

* Yield reduced by bacterial wilt.

Summary of Variety Trials.

The outstanding varieties this season were again Bonny Best, Norton, Norduke, and Chalk's Early Jewel. It was most unfortunate that the Bonny Best plot in the non-irrigated trial was affected with *B. vesicatorium*, as

the same variety in the fertiliser trial on adjacent ground yielded very well. The attractive features of this variety are its excellent quality, and firm fruit combined with early ripening. Norton and Norduke both produce fruit of good quality, but are a little on the late side, particularly Norduke. Chalk's Early Jewel yielded well, but has the disadvantage of being a poor carrying variety. The Earliana strains did not yield well, and from trials over the past three seasons do not seem suitable to Bathurst conditions, and could advisably be dropped.

Of the new varieties, Marglobe is worthy of further attention. Although not a heavy yielder this season, the fruit was of particularly fine quality, being deep and of a good red colour when cut across. The skin is firm and no core is present. The flavour is slightly acid, and the variety crops well right to the end of the season. Santa Clara Canner, while having fair quality flesh, is of poor appearance, being large and irregular, deeply indented at both stem and blossom ends. It is also rather late for local conditions. Money Maker is worth further trial. The fruit was of fair quality, although the yield was not high.

Plant-raising Trials.

The trial was carried out to determine the most suitable method of raising plants. Seedbeds were prepared, both in the hot frame and in outside beds as follows:—

Hot Frame.—A foot of stable manure was placed in the bottom of the frame and the seed boxes placed on the top.

Outside Beds.—These were covered at night with cornsacks supported on wires, and the different beds were treated as follows:—

1. No manure.—Seed sown in ordinary ground and mulched.
2. Farmyard manure well dug in.—Seed sown as above.
3. Superphosphate and farmyard manure.—Manure well dug in, and superphosphate raked in lightly before sowing.
4. Superphosphate, wood ashes and farmyard manure.—The manure and wood ashes were dug into the bed, and the superphosphate raked in lightly.
5. Superphosphate, sulphate of ammonia and farmyard manure.—Farmyard manure dug in, and sulphate of ammonia raked in with the superphosphate.
6. Farmyard manure dug in, and seed sown in rows 1 foot apart.

Results.

The seed of Bonny Best variety was sown on 29th August, and all plots mulched lightly with farmyard manure. Germination was good in all plots.

The following notes were taken when the seedlings were transplanted on 15th November:—

The hot frame plants were small and of rather pale colour, with poor root systems.

The outside beds gave the following results:—

1. No manure.—Small plants, short and thick. Small bunch of fibrous roots. Plants fairly sturdy.
2. Farmyard manure only.—Good sturdy plants, medium short. Fairly long main root, very few fibrous roots.
3. Superphosphate and farmyard manure.—Good strong plants, medium height. Fairly long tap-roots, and a few fibrous roots.
4. Superphosphate, wood ashes and farmyard manure.—Strong vigorous plants, medium tall. Long main root and good bunch of fibrous roots.
5. Superphosphate, sulphate of ammonia and farmyard manure.—Tallest plants of any, but slightly weak. Roots not plentiful; main root and one or two branches.
6. Grown in rows with farmyard manure.—Very sturdy stocky plants, medium height. Good root system, very branched.

Summary of Plant-raising Trials.

The best plants were those grown with superphosphate and wood ashes, and those grown in rows. There does not appear to be any advantage in using hot frames under local conditions. Plants can be raised in covered beds early enough and with less trouble. This has also been proved to be the case in previous seasons.

Plants from each bed were put out in the field on 15th November, but weather conditions at the time were so good that no difference was noted. The season was a good one for summer crops. Following on a dry frosty winter, which allowed of good preparation of the land, came a fairly mild moist spring. Showery weather was experienced at planting out time and good falls of rain were experienced regularly throughout the summer. The autumn was mild, frosts holding off until well into May.

RAINFALL.

Before Planting.		On Crop	
August	101 points.	November	229 points.
September	176 ,,	December	150 ,,
October	245 ,,	January	250 ,,
November	117 ,,	February	657 ,,
		March	412 ,,
		April	94 ,,
Total	639 ,,	Total	1,792 ,,

Fertiliser Trials.

The irrigated fertiliser trial was discarded owing to planting being delayed on account of no water being available, and because of further uneven watering later in the season.

The non-irrigated trial was carried out on an adjacent area to the variety trial. Previous cropping and preparation of the land being the same.

Plants were raised in outside beds, covered at night with hessian. Seed of Bonny Best was sown on 29th August, and strong, healthy plants were produced. Planting out took place on 5th November. The land was in

excellent order and the weather showery and dull, making ideal planting conditions. Plots consisted of three rows 4 ft. 6 in, apart. Half of each plot had been top-dressed with agricultural lime at ¾ ton per acre on 23rd August. The fertiliser was applied about a week after planting and chipped in. The following mixtures were used:—

1. Superphosphate, 3 cwt. per acre.
2. Superphosphate, 3 cwt.; and sulphate of ammonia, 1 cwt. per acre.
3. Superphosphate, 3 cwt.; and sulphate of potash, 1 cwt. per acre.
4. Superphosphate, 3 cwt.; sulphate of ammonia, 1 cwt.; and sulphate of potash, 1 cwt. per acre.
5. No manure.

Another plot similar to No. 4 was laid down, and it was to receive an additional dressing when the fruit had set. The vine growth, however, was by that time too profuse to allow of spreading and cultivating in the fertiliser. It would appear that this system is practicable only with staked vines.

Growth was good and rapid. The vines covered the ground between the rows and set fruit well. Very little disease was present. A few plants developed bacterial spot, and several cases of bronze wilt were noticed. Irish blight appeared late in the season. The superphosphate plot appeared to be the healthiest, but no plot could really be termed diseased. The first fruit was harvested on 25th January, and the last on 11th April.

RESULTS of Fertiliser Trials with Tomatoes.

Treatment.	Yield per Acre.	Increase Yield	Increase Value	Decrease Yield	Decrease Value.	Cost of Treatment	Net Gain	Total Loss
				Limed Area.				
	t. c. q. lb.	t. c. q. lb.	£ s. d.	t. c. q. lb.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Superphosphate ...	6 0 1 19	1 17 1 15	9 6 11	..	.....	0 17 6	8 9 5	.....
Superphosphate and Sulphate of Potash ...	5 6 2 4	1 3 2 0	5 17 6	.	...	1 14 0	4 3 6	......
Superphosphate and Sulphate of Ammonia. ..	4 16 1 11	0 13 1 7	3 6 7	. .	.	1 15 6	1 11 1	......
No Manure (Check Plot) ...	4 3 0 4	.	......	.....	..	.....	..	......
Superphosphate, Sulphate of Potash, and Sulphate of Ammonia	3 14 3 0	....	.	0 8 1 14	2 1 5	2 12 0		4 13 5
Superphosphate, Sulphate of Potash, and Sulphate of Ammonia .. .	3 7 3 0	....	..	0 15 0 12	3 15 7	2 12 0	.	6 7 7
				Unlimed Area				
Superphosphate	5 11 2 3	0 15 2 1	3 17 6	. .	.	0 17 6	3 0 0	......
Superphosphate and Sulphate of Potash	5 6 3 8	0 10 3 6	2 14 0	....	.	1 14 0	1 0 0	.....
Superphosphate, Sulphate of Ammonia, and Sulphate of Potash	5 6 0 17	0 10 0 15	2 10 8	....	...	2 12 0	....	0 1 2
No Manure (Check Plot) ...	4 16 0 2	......		...	.....	....		.....
Superphosphate, Sulphate of Ammonia, and Sulphate of Potash	4 10 0 5	......	.....	0 5 3 15	1 9 5	2 12 0	....	4 1 5
Superphosphate, Sulphate of Ammonia, and Sulphate of Potash	3 12 0 2	......	....	1 4 0 0	6 0 0	1 15 6	.....	7 15 6

From the above table it appears that 3 cwt. superphosphate per acre is of direct benefit in increasing the yield of tomatoes. On both the limed and

unlimed areas this plot gave the greatest net gain. Comparing the limed and unlimed areas, the checks on the unlimed area outyielded the checks on the limed, but the superphosphate and lime greatly outyielded the superphosphate alone. This would suggest that basic superphosphate would probably be a suitable fertiliser. Although other combinations of fertilisers gave increased yields, none of them equalled the superphosphate alone.

TOPPING AND SULPHURING GRAPE VINES.

LAST season the Viticultural Branch of the Department of Agriculture conducted experiments on Mr. McKenzie's farm at Griffith, on the Murrumbidgee Irrigation Areas, to ascertain if either topping or sulphuring vines (or both operations combined) at flowering period would improve their setting and cropping habits.

The block of vines selected for the trial by Mr. N. Lackie, Viticultural Instructor, was an even portion of a Madeira vineyard which had not been giving satisfactory results. To make the experiment as interesting as possible, vines were treated according to two systems—straight-out spurs, and rod and spurred as in the ordinary Bordelais system. A check plot was included. The number of vines treated in each case was the same, and all vines were of somewhat similar strength. The rows were numbered and treated as follows:—

Rows 27 and 28—Check plots, not treated.
,, 29 and 30—Topped, 2nd November, 1927.
,, 31 and 32—Topped and sulphured, 2nd November, 1927.
,, 33 and 34—Sulphured, 2nd November, 1927.

Yields from the different treatments are given hereunder:—

Row 27—Rod-pruned; check plot not treated. Yielded 37 buckets (kerosene tins) of grapes.
,, 28—Spur-pruned; check plot not treated. Yielded 25 buckets.
,, 29—Rod-pruned, topped. Yielded 37 buckets.
,, 30—Spur-pruned, topped. Yielded 19 buckets.
,, 31—Rod-pruned, topped and sulphured. Yielded 35 buckets.
,, 32—Spur-pruned, topped and sulphured. Yielded 24 buckets.
,, 33—Rod-pruned, sulphured. Yielded 35 buckets.
,, 34—Spur-pruned, sulphured. Yielded 19 buckets.

The results of the above experiments show that no improvement in cropping resulted from topping and sulphuring, but it will be seen that Madeira responded better to rod-pruning than when pruned on the spur. It may also be mentioned that the balance of the vineyard was pruned alternately according to both systems, and the portion that was rod-pruned showed an increase of more than a ton per acre over that spur-pruned.—H. L. MANUEL, Viticultural Expert.

IN planning our diet we ought, wherever possible, plan it around milk as the nucleus. Milk, as we have seen, contains the three classes of foodstuffs—the mineral salts, proteins rich in the necessary amino-acids, and vitamines.

Farmers' Experiment Plots.

POTATO TRIALS, 1927-28.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

THE following growers co-operated with the Department during the year in the carrying out of variety and fertiliser trials with potatoes :—

J. G. Ward, Sherwood, Macleay River.
F. Waters, East Kempsey, Macleay River.
J. P. Mooney, Dumaresq Island, Manning River.
A. W. Singleton, Mondrook, Manning River.
Colin Shields, Mt. George, Manning River.
M. Smith, Paterson, Paterson River.

The Season.

The season was one of the most favourable experienced for some time for potato crops. High yields were harvested from the majority of the plots. At East Kempsey, where the country is low-lying, the crop failed owing to too much rain. The winter months were dry, and this allowed of good cultural operations being adopted. Early ploughing is most essential for the conservation of moisture and for securing a mellow seed-bed, and those who failed to plough earlier than mid-winter were faced with rather a dry July and August, making it difficult to secure the class of seed-bed necessary for maximum potato yields. Still the season was such that the general run of crops, whether sown on well prepared or on poorly prepared plots, yielded much above the average. In many instances crops made such luxuriant top-growth after the October rains that it was feared tubers would not form. However, only in a very few instances did the crops fail "to bottom." Much second growth was noticeable.

Fungus diseases were almost entirely absent, owing to the mild conditions prevailing.

The Plots.

Sherwood.—Previous crop, maize; harrowed and burnt; ploughed, first week in July; left four weeks; rolled; disc-harrowed; sets ploughed in on 13th August. The soil was in good condition, but somewhat on the dry side. The sets were ploughed in deeper than usual, and this seems to have stuck to them, the germination being good. Harrowed, hilled, and scarified twice. Factors yielded the poorest samples, a lot of second growth being noticeable. Up-to-Dates were also a poor lot, due to the same cause. Satisfactions and Manhattans were good. Rainfall at Sherwood was as follows :—August,

20 points; September, 36 points; October, 308 points; November, 665 points, and December, 301 points, making a total of 1.330 points for the five months.

Dumaresq Island.—Under lucerne for fourteen years; maize in 1926-27. Ploughed in April; fallowed till August; rolled; harrowed twice; rolled; ploughed; harrowed three times; sets ploughed in. The soil was in good condition and germination was good. Scarified twice after an earlier harrowing, and hilled. Well rotted farmyard manure made a remarkable difference when applied to the rows. Actual rainfall registrations for Dumaresq Island are not available, but those for Taree are as follows:—August, 18 points; September, 94 points; October, 225 points; November, 813 points; December, 555 points; January, 620 points, making a total of 2,325 points for the six months, August, 1927, to January, 1928.

Mondrook.—Rich alluvial soil, originally an old cattle-feeding ground. Ploughed in September and October, 1926; sown to cauliflowers; ploughed in July; harrowed and rolled; ploughed again before sowing, and harrowed. Sown in drills 3 feet apart. The soil was in excellent order, and germination was good. Harrowed, scarified. Extraordinary top-growth, and an excellent crop. Dug first week in February. Only the marketable tubers were weighed, it being necessary to discard as rotten one in every four of the Manhattans, otherwise there would probably have been an enormous crop. See rainfall figures for Taree, as given under Dumaresq Island.

Mt. George.—Soil, rich alluvial; under pumpkins, 1926; ploughed, May; harrowed and disc-harrowed, and ploughed again first week in August; harrowed twice; sown in drills 3 feet apart and covered with the plough. Germination was fairly good. Harrowed; scarified twice; hilled. Rainfall a little less than at Taree, which figures are given in dealing with the Dumaresq Island plot.

Paterson.—Light loamy soil, ploughed once; irrigated before sowing; previous crop, pumpkins. Sets ploughed in, harrowed; germination good. Hilled; scarified twice. This was a very good crop, especially the Manhattans. At Taree the rainfall was 2.325 points for the six months, commencing August, 1927—see Dumaresq Island plot.

RESULTS of Variety Trial.

Variety	Sherwood (sown 15 Aug.)		Dumaresq Is. (sown 10 Aug.)		Mondrook (sown 15 Aug.)		Mt. George (sown 23 Aug.)		Paterson (sown 24 Aug.)	
	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.
Factor	10	12	13	2	10	4	11	0	5	10
Manhattan ..	9	0	12	5	12	17	7	17	5	10
Up-to-Date .	11	0	12	0	11	1	11	7	6	6
Satisfaction .	9	16	13	5	11	3	12	8	5	2

No manure was used on any of the variety plots. White-skinned varieties did best at Sherwood and Mt. George. Manhattan yielded poorly.

Results of Fertiliser Trial.

Fertiliser.	Sherwood (Factor).		Dumaresq Is. (Up-to-Date).		Mondrook (Up-to-Date).		Mt. George (Factor).		Paterson (Manhattan).	
	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.
No manure	10	12	12	0	11	1	11	0	5	10
P11 mixture (326 lb.) ...	11	2	12	3	...		10	2	7	17
P12 mixture (326 lb.) ...	11	6	12	0	...		10	4	7	9
P13 mixture (372 lb.) ...	10	16	12	8	...		11	0	7	9
M22 mixture (280 lb.) ...	11	0	11	6	...		12	7	6	13
Superphosphate (280 lb.) ...	10	12	11	2	8	14	13	1	6	6
Farmyard manure (about 5 tons per acre).	...		15	2	...		...		...	
P14 mixture (373 lb.) ...	...		...		9	9	...		...	
P15 mixture (373 lb.) ...	...		...		8	17	...		...	
P16 mixture (466 lb.) ...	...		...		9	7	...		...	

NOTE.—P11 mixture consists of 6 parts superphosphate and 1 part sulphate of ammonia; P12, 6 parts superphosphate and 1 part sulphate of potash; P13, 6 parts superphosphate, 1 part sulphate of ammonia, 1 part sulphate of potash: P14, 3 parts superphosphate, 1 part sulphate of potash; P15, 3 parts superphosphate, 1 part sulphate of ammonia; P16, 3 parts superphosphate, 1 part sulphate of potash, 1 part sulphate of ammonia; M22, equal parts of superphosphate and bonedust.

At Sherwood, and particularly at Paterson, slight increases in yield, due to the application of fertiliser, were recorded. At Mt. George M22 mixture and superphosphate gave the best returns. Mostly negative results were obtained from the use of fertilisers at Mondrook. At Dumaresq Island an application of farmyard manure (well-rotted) increased the yield from 3 to 4 tons over the other fertilised and non-fertilised plots.

Marketing the Crop.

There was a glut of potatoes in the Lower North Coast district, many farmers finding it must difficult to dispose of more than a small percentage of their crops, and even then at a low rate. Quite a number left the crops untouched until the autumn, hoping then to secure better prices. Whilst this procedure is somewhat risky on our warm moist coast, owing to the tubers invariably rotting, a few farmers did secure slightly higher prices. Taken all round, however, the crops were unprofitable, many hundreds of tons going to waste.

The Harrow on Riverina Fallows.

CAREFUL investigations have shown that on average Riverina soils it is advisable to give the fallows a good harrowing in the spring prior to the deep working with the springtooth. This breaks down the clods, making the work of springtoothing lighter on both horses and machine, and resulting in a larger proportion of fine soil for the foundation of the seed-bed, while the clods are more easily brought to the surface. The practice was followed by the owners of the leading fallows in each district competition this season.—G. C. BARTLETT, Agricultural Instructor.

Contagious Streptococcic Mastitis of Dairy Cows.

Effect of Treatment with Streptococcic Vaccine.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H.

VARIOUS treatments have been advocated from time to time for the control and cure of contagious mastitis of dairy cattle, but the experience of the veterinary staff of the Stock Branch of the Department of Agriculture has led to the opinion that the only method of treatment which has given any satisfactory results has been the vaccination of cattle with a vaccine prepared from the causal organism. Over fourteen years ago experimental work in this direction was carried out, the vaccine being an autogenous one prepared from the strains of *streptococcus* isolated from the milks of affected cows. The results were distinctly promising, but owing to the outbreak of war this work was abandoned for the time being.

From the year 1921 on the work was continued, but the vaccine prepared by the Commonwealth Serum Laboratories was used. As a result of this work, carried out experimentally in about twelve herds (involving some 500 head of cattle), the opinion was formed that the vaccine could be depended upon to protect cattle from attacks of this disease provided that they were not infected at the time of vaccination. The curative value of the vaccine seemed to be very variable and farmers were advised to vaccinate healthy cattle only as a preventive measure. This course was widely followed with excellent results generally, although in a few cases there were adverse reports. On investigation it was found in each of these cases that the farmers had vaccinated the whole herd whilst experiencing an acute manifestation of the disease, and were disappointed that immediately after vaccination the disease had not ceased. As a matter of fact, in one or two cases the disease appeared to rage with greater virulence after vaccination, and the question arises as to whether, in infected cows, the injection does not tend to intensify the symptoms. The fact remains, however, that with some thousands of cattle vaccinated in this State, general satisfaction has been expressed with the vaccine as a preventive.

Although so many herds have been treated, both by officers of the Stock Branch of the Department and practitioners, we have been able to collect few records of the actual history of a number of individual animals in a herd. Few farmers keep records of the ailments of their cattle and the treatment adopted, and they perforce depend upon their memories, which are not always reliable. However, Mr. H. A. D. Crossman, of Quirindi, having a small herd and being keenly interested in the matter, kept accurate records of his cattle over a period of more than four years, noting down the symptoms

as far as he could diagnose them, and the treatments given. In addition the cattle were inspected from time to time and notes taken of the findings. The history of the herd is of great interest, since, although the number of cattle is not large, the records indicate that the vaccine prepared by the Commonwealth Serum Laboratories has a definite curative as well as a preventive action if used regularly.

History of the herd prior to vaccination.—During the years 1923 and 1924, the cows in the herd were affected with acute attacks of contagious mammitis. During these two years the owner was forced to sell to the butcher so many cows (rendered useless for milk production) that he twice completely replaced his herd, and he made up his mind to discontinue dairying.

History of the herd after vaccination.—The matter was brought under the notice of the Stock Branch and the cattle were examined. The diagnosis of contagious streptococcic mastitis was confirmed by bacteriological examination at Glenfield. It was then decided to treat the cattle with vaccine. So successful has this treatment proved that the owner has not, since the date of the first vaccination, sold a cow on account of mastitis. Three cows only have been sold and they were disposed of to a milk vendor. Eight of the fourteen cows in the herd had suffered from mastitis more or less severely at the time of the first examination, yet all recovered to such an extent as to be of value to the owner. In all cases the four teats are functioning—there are no three-teaters in the herd. Five of the cows had never suffered from mastitis at the time of the first examination and these have not contracted the disease. One cow appeared to have contracted mastitis after the first vaccination. The lesions, however, were not typical of contagious mastitis. Unfortunately, no milk examination was made as the samples forwarded were lost in transit. The animal made a complete recovery and the disease has not recurred.

History of Individual Cows.

In the summary of the history of each cow that follows it will be noted that in these cases it was the practice to vaccinate each cow about the time of parturition. In some cases, where the cows were affected before vaccination commenced, they gave a little curdy milk at times. The occurrence of this was transient and the supply of milk was not affected.

Nobette.—

4-7-24—Calved (5th calf).

4-10-24—Had previously suffered from mammitis. R.F. (right fore) quarter of udder had nodule in front of milk sinus and fibrosis extending into udder tissue. R.H. (right hind) quarter had cord-like fibrosis extending from above base to teat into udder tissue. L.F. (left fore) quarter same as R.H. quarter. L.H. quarter was O.K.

6-10-24—R. F. quarter showed slight inflammation with curdy milk. This condition continued till 10th October, 1924.

19-10-24—R.F. quarter of udder again showed curdy milk and this continued till 26th October, 1924.

20-11-24—Vaccine (3 c.c.).

22-11-24—Vaccine (7 c.c.).

25-11-24—Vaccine (10 c.c.).

12-3-25—R.F. quarter, nodule at base of teat not perceptible, but slight fibrosis above milk sinus. R.H. quarter showed slight thickening above milk sinus. L.F. quarter apparently normal, as was L.H. quarter.
7-11-25—Calved; vaccinated.
8-11-25—Milk fever.
25-12-25—L.F. quarter slightly swollen and hard; milk slightly curdy.
26-12-25—Swelling in L.F. quarter gone, but milk still curdy.
30-12-25—Milk in L.F. quarter still curdy.
12-1-26—L.F. quarter had few small curds in milk.
17-2-26—L.F. quarter „ „ „
5-5-26—L.F. quarter „ „ „
6-6-26—R.F. quarter „ „ „
27-8-26—L.H. quarter „ „ „
21-12-26—Calved.
15-12-26—Vaccine (3 c.c.).
18-12-26—Vaccine (7 c.c.).
21-12-26—Vaccine (10 c.c.).
25-10-27—Calved.
15-10-27—Vaccine (3 c.c.).
18-10-27—Vaccine (7 c.c.).
21-10-27—Vaccine (10 c.c.).
23-10-27—Commenced milking two days before calving.

This cow was six years of age when first inspected. She had suffered from previous acute attacks of mastitis. She was vaccinated immediately after or before subsequent parturitions. There were structural changes in the udder. Following vaccination there was a steady improvement in the cow, as evidenced by the cessation of acute attacks of mastitis and disappearance of the fibrotic areas in the udder. At odd intervals there would appear slight evidence of the disease in the form of a few flakes of curd in the milk, but there was no interference in the milk supply. On casual examination the udder appeared normal (February, 1928), but a more careful inspection showed some thickening of the milk sinus.

Daisy—

14-11-17—Born. Dam and grand-dam both have histories of infection with contagious mastitis.
4-10-24—Slight cord-like fibrosis above base of teat.
29-10-24—Vaccine (3 c.c.).
31-10-24—Vaccine (7 c.c.).
3-11-24—Vaccine (10 c.c.).
20-5-25—Sold to a milk vendor (after his examination) for £10 10s.

Rosebud—

20-10-19—Born. Dam and grand-dam both suffered from contagious mastitis.
4-10-24—Calved (3rd calf). Supra mammary glands both enlarged and prominent, soft to the touch, not painful (œdematous), acute mastitis had been present but had been treated with hot foments, stripping, and massage.
20-11-24—Vaccine (3 c.c.).
23-11-24—Vaccine (7 c.c.).
27-11-24—Vaccine (10 c.c.).
23-11-24—Condition improving.
30-11-24—Appeared normal, giving 45 lb. milk daily.
12-3-25—L.F. quarter showed pea-like nodules at base of teat, post mammary glands normal.
20-5-25—Sold to a milk vendor (after his examination) for £10 10s.

This, and the previous case, indicate that the cattle were apparently normal and were giving a satisfactory milk supply when sold. The vendor informed me that the purchaser has had no trouble with these cows.

Bluebell.—

29-7-25—Calved (5th calf), age 7 years 9 months. Dam suffered from mastitis.

4-10-24—L.F. quarter showed slight fibrosis at base of teat. R.F. quarter showed thickening of teat duct, and fibrosis extending into sinus, nodule in front of quarter. Quarter frequently injured by cow going through fences. Diffuse fibrosis of posterior half of L.H. quarter.

20-11-24—Vaccine (3 c.c.).

23-11-24—Vaccine (7 c.c.).

26-11-24—Vaccine (10 c.c.).

12-3-25—R.F. quarter had small shot-like nodule in udder substance. L.F. quarter had nodule in milk sinus. R.H. quarter had nodule at back of sinus extending upward and becoming diffuse.

9-7-25—Calved.

10-7-25—Vaccine (3 c.c.).

13-7-25—Vaccine (7 c.c.).

16-7-25—Vaccine (10 c.c.).

12-10-25—As on 12th March, 1925.

12-8-26—Calved; milk fever; L.F. teat burst.

14-8-26—Vaccine (3 c.c.).

17-8-26—Vaccine (7 c.c.).

20-8-26—Vaccine (10 c.c.).

12-8-26 to 15-8-26—L.F. and R.F. quarters gave curdy milk.

27-8-26—L.H. quarter gave curdy milk.

28-8-26— „ „

30-8-26— „ „

31-8-26— „ „

28-8-27—Calved.

15-8-27—Vaccine (3 c.c.).

18-8-27—Vaccine (7 c.c.).

21-8-27—Vaccine (10 c.c.).

28-2-28—R.F. udder generally fleshy to feel, probably slight generalised fibrosis. L.F., nodule in udder; R.H. quarter slight generalised fibrosis; L.H. showed nodules, but milked out well leaving the quarter flaccid.

This cow suffered from severe mastitis and although not totally cured. was so improved as to be of economic value to the owner as the following record shows:—For the nine months ending 8th May, 1927, this cow gave 5,940 lb milk, making 322·6 lb. butter. Average test was 4·77 per cent.

Wog.—

20-7-22—Born. Dam suffered from mastitis.

20-11-24—Vaccine (3 c.c.).

23-11-24—Vaccine (7 c.c.).

26-11-24—Vaccine (10 c.c.).

1-9-25—Calved.

1-9-25—Vaccine (3 c.c.).

4-9-25—Vaccine (7 c.c.).

7-9-25—Vaccine (10 c.c.).

5-9-25—Curds in milk.

7-9-25— „ „

28-10-25—R.F. quarter showed slight cord-like thickening above base of teat.

18-11-26—Calved.

15-11-26—Vaccine (3 c.c.).

18-11-26—Vaccine (7 c.c.).

21-11-26—Vaccine (10 c.c.).

15-10-27—Calved.

11-10-27—Vaccine (3 c.c.).

14-10-27—Vaccine (7 c.c.).

17-10-27—Vaccine (10 c.c.).

23-2-28—R.F. quarter showed slight cord-like thickening above base of teat. R.H. quarter showed slight thickening in milk sinus.

This cow was affected with contagious mastitis when first seen, but from 7th September, 1925, no symptoms of mastitis have been noted.

O'Golly—

31–7–21—Born.
28–8–24—On second calf.
4–10–24—Slight enlargement in upper posterior part of R.F. quarter.
8–10–24—R.F. quarter showed nodule in udder above the enlargement, slight inflammation of udder and curds in milk.
10–10–24—R.F. quarter enlargement decreasing in size, but very firm. Milk apparently normal.
20–11–24—Vaccine (3 c.c.).
23–11–24—Vaccine (7 c.c.).
26–11–24—Vaccine (10 c.c.).
—1–25—Enlargement still present but less prominent.
29–1–25—Enlargement disappeared and udder apparently normal.
12–3–25—Apparently normal.
10–8–25—Calved.
11–8–25—Vaccine (3 c.c.).
14–8–25—Vaccine (7 c.c.).
17–8–25—Vaccine (10 c.c.).
15–10–26—Calved.
16–10–26—Vaccine (3 c.c.).
19–10–26—Vaccine (7 c.c.).
22–10–26—Vaccine (10 c.c.).
18–8–27—Calved.
15–8–27—Vaccine (3 c.c.).
18–8–27—Vaccine (7 c.c.).
21–8–27—Vaccine (10 c.c.).
22–2–28—Apparently normal.

This cow, for period of nine months ending 9th July, 1927, gave 4,925 lb. milk, testing 5·34 per cent. butter-fat, and producing 279·33 lb. butter

Shasta—

19-7-27—Born. Dam, grand-dam, and great-grand-dam suffered from mastitis.
16–1–25—Calved.
18–1–25—Vaccine (3 c.c.).
21–1–25—Vaccine (7 c.c.)
24–1–25—Vaccine (10 c.c.).
12–3–25—Apparently normal.

Sold to milk vendor for £10 10s.

Ragged Blossom—

12–8–24—4th calf.
9–10–24—Mammitis. Curdy milk.
12–10–24—Apparently normal.
26–8–25—Calved.
27–8–25—Vaccine (3 c.c.).
30–8–25—Vaccine (7 c.c.).
2–9–25—Vaccine (10 c.c.).
28–10–25—Normal.
17–10–26—Calved.
17–10–26—Vaccine (3 c.c.).
20–10–26—Vaccine (7 c.c.).
23–10–26—Vaccine (10 c.c.).
29–9–27—Calved.
21–9–27—Vaccine (3 c.c.).
24–9–27—Vaccine (7 c.c.).
27–9–27—Vaccine (10 c.c.).
25–2–28—Slight cording in one milk sinus

For nine months ending 9th July, 1927, this cow produced 5,715 lb. milk, making 352 lb. butter.

Milk Maid—

10-1-23—Born.
31-12-24—L.F. teat duct sore, and curdy milk.
1-1-25—Vaccine (3 c.c.).
4-1-25—Vaccine (7 c.c.).
7-1-25—Vaccine (10 c.c.).
3-1-25—Milk removed with quill—milk syphon was used continuously until 25th March, 1925. Teat never became normal
8-1-25—Milk curdy, and scab formed over end of teat No signs of inflammation.
12-1-25—Milk appeared normal. L.F. quarter had nodule in udder, with several cord-like fibrosis extending from teat upwards for 1½ inches.
19-1-25—Milk samples sent to Glenfield Research Station; positive streptococcic mammitis.
30-1-25—L.F. quarter very firm to feel.
5-3-25—L.F. quarter had blood clots in milk.
23-10-25—L.F. quarter showed slight thickening at back of milk sinus. Cord-like fibrosis not perceptible. Milk yield of quarter reduced.
14-2-26—Calved.
15-2-26—Vaccine (3 c.c.).
18-2-26—Vaccine (7 c.c.).
21-2-26—Vaccine (10 c.c.).
16-2-26—R.F. quarter gave curdy milk.
11-2-27—Calved.
3-2-27—Vaccine (3 c.c.)
6-2-27—Vaccine (7 c.c.).
9-2-27—Vaccine (10 c.c.).
23-2-28—L.F. quarter showed slight diffuse thickening front and back of teat.

This animal was affected with mammitis prior to examination. The first treatment with vaccine did not cure the animal although it relieved the acute symptoms. Evidences of mammitis as shown by curdy milk were present at odd times for thirteen months after first treatment, but for two years the animal has shown no symptom of the disease and is milking well.

Plum.—

14-12-21—Born.
27-5-25—Normal.
29-7-25—Calved.
29-7-25—Vaccine (3 c.c.).
31-7-25—Vaccine (7 c.c.).
3-8-25—Vaccine (10 c.c.).
23-2-28—Normal.

This cow was vaccinated at about the time of parturition in 1926, 1927, 1928, and has never shown any symptom of contagious mastitis.

Miss Nob—

1-11-22—Born. Dam, Nobette.
3-2-25—Calved—calf left with dam, and cow milked daily till 18th March, 1925.
3-2-25—Vaccine (3 c.c.).
6-2-25—Vaccine (7 c.c.).
9-2-25—Vaccine (10 c.c.).
8-2-25—L.F. teat walls appeared thickened but soft to feel.
9-2-25—Above condition not so marked.
14-2-25—L.F. quarter gave little curdy milk.
3-3-25—R.H. quarter showed few blood clots in milk.
12-3-25—L.F. quarter had few small nodules in back of base of teat.
20-10-25—Udder apparently normal.
24-2-26—Calved.
24-2-26—Vaccine (3 c.c.).
27-2-26—Vaccine (7 c.c.).
2-3-26—Vaccine (10 c.c.).

At 1926, 1927, 1928 parturitions Miss Nob was vaccinated. This is an interesting case in that the animal after vaccination, dating from day of parturition, evidenced some signs of mastitis. The following points are to be kept in mind:—(*a*) The lesions were not typical of streptococcic contagious mastitis, and (*b*) our knowledge of the method of infection is incomplete, and we are not justified in assuming that the cow, although at her first parturition, was not infected prior to the birth of the calf. Her mother suffered from acute mastitis. In any case the attack of mastitis was very mild and no further evidence of the disease has been noted.

Petal—

21-3-23—Born.
8-4-25—Calved. Reared calf till 28th June, 1925.
24-6-25—Vaccine (3 c.c.).
27-6-25—Vaccine (7 c.c.).
30-6-25—Vaccine (10 c.c.).
28-10-25—Normal.
7-6-26—Calved.
11-6-26—Vaccine (3 c.c.).
14-6-26—Vaccine (7 c.c.).
17-6-26—Vaccine (10 c.c.).
23-2-28—R.F. quarter showed very slight cording in milk sinus. L.F. quarter had pea-like nodule at top of milk sinus.

This animal has never shown any symptom of mammitis. The lesions mentioned in the examination dated 23rd February, 1928, were very slight and were probably not due to streptococcus infection. For the nine months ending 6th March, 1927, this animal gave 5.505 lb. milk, making 330 lb. butter.

Cherriwog—

21-6-23—Born.
29-3-25—Calved.
27-3-25, 30-3-25, 2-4-25—Vaccinated.
29-10-25—Normal.
23-2-28—Normal.

Vaccinated at parturitions in 1926 and 1927. No symptoms of mammitis ever noted.

Shasta II.—

16-1-25—Born.
9-11-26—Calved.
9-11-26 to 15-11-26—Vaccinated.
12-11-27—Calved.
2-11-27, 6-11-27, 9-11-27—Vaccinated.

Marguerite—

12-9-24—Born.
19-1-27—Calved.
20-1-27 to 27-1-27—Vaccinated.
6-12-27—Calved.
1-12-27 to 7-12-27—Vaccinated.

No evidence of mastitis in either of these animals.

Spraying for Woolly Aphis.

The Addition of Miscible Oil to Summer Tobacco Sprays.

A. R. WOODHILL, B.Sc.(Agr.), Assistant Entomologist.

It will be a matter of interest to growers to note the results of tests carried out by the Entomological Branch and by Mr. W. M. Walker, orchardist at Glen Innes Experiment Farm, on the use of tobacco sprays alone and with the addition of small quantities of miscible oil as a control for woolly aphis. The results, it will be seen, indicate that no advantage was gained by adding miscible oil to either home-made tobacco wash or nicotine sulphate.

The first tests were carried out in 1924, 1926, and 1927 at Glen Innes Experiment Farm, and an estimation of the results, based on the freedom from woolly aphis infestation of the sprayed and control trees, was made by the orchardist. It was found, however, that the field examinations did not give definite indications of the results from adding oil to the spray, as the re-infestation of the trees by woolly aphis was rather erratic, and probably depended to a great extent on the fact that a few aphides here and there were missed by the spray, as it is practically impossible to wet every aphid on a tree.

Details of the Experiments.

An experiment was therefore carried out in November, 1927, by the Entomological Branch in conjunction with the orchardist at Glen Innes Experiment Farm in order to obtain more accurate information. The following sprays were used:—

1. Nicotine sulphate (40 per cent.), 1 part to 800 parts of water, plus 3 pints miscible oil per 100 gallons spray.
2. Nicotine sulphate (40 per cent.), 1 part to 800 parts of water, plus 8 pints miscible oil per 100 gallons spray.
3. Nicotine sulphate (40 per cent.), 1 part to 800 parts of water.
4. Tobacco wash, Departmental formula, plus 3 pints miscible oil per 100 gallons spray.
5. Tobacco wash, Departmental formula, plus 8 pints miscible oil per 100 gallons spray.
6. Tobacco wash, Departmental formula.
7. Miscible oil, 3 pints to 100 gallons water.
8. Miscible oil, 8 pints to 100 gallons water.

Sixteen trees were selected, and two trees were sprayed with each of the above sprays, four control trees being left unsprayed. All the trees showed a medium infestation by woolly aphis. The trees were thoroughly sprayed, and in addition two colonies of aphides were selected on each tree, and these

were carefully sprayed without dislodging them from the branches. The marked colonies were examined twenty-four hours after spraying, and it was found that wherever the aphides had been thoroughly drenched with sprays Nos. 1 to 6 they had been killed. No difference could be detected in the results from sprays Nos. 1 to 6, a uniformly satisfactory kill being obtained.

With sprays Nos. 7 and 8 the kill was not satisfactory.

The trees were again inspected a month later, and it was found that sprays Nos. 1 to 6 had given approximately equal results. The re-appearance of a few colonies of aphids on the sprayed trees was erratic, but on the whole no distinct advantage could be ascribed to any one of the sprays Nos. 1 to 6, but the trees sprayed with the oil only (sprays Nos. 7 and 8) were decidedly more heavily infested.

Conclusions.

The control trees were more heavily infested than the trees treated with sprays Nos. 1 to 6, but were cleaner than the trees on which sprays Nos. 7 and 8 were used. This latter irregularity was probably due to the destruction of the woolly aphis by predators and parasites, and confirmed the previously mentioned fact that fine distinctions could not be drawn between different sprays by noting the degree of re-infestation of the trees.

Noticeable burning of the foliage took place with all the sprays to which 8 pints of oil per 100 gallons had been added, and to a lesser extent with those containing 3 pints oil per 100 gallons. The damage was not sufficient to greatly injure the health of the trees, but if repeated several times during the summer the effect on the trees would be serious.

These limited tests thus indicated that no advantage is gained by adding small quantities of miscible oil to tobacco sprays for woolly aphis, and that if a greater quantity than 2 pints per 100 gallons is added burning of the foliage may result.

The chief factors in successful control appear to be the use of a high-pressure pump giving a solid driving jet of spray such as is obtained from a spray gun, and ensuring thoroughness of application. Where the woolly aphis parasite has been established, however, it is probable that spraying will only occasionally be necessary.

Good Drilling is Economy.

It is not uncommon to see wide misses in a wheat crop, or more important still, too wide a space between drill widths. Some use may be made of the vacant land by adjacent wheat plants, but more often it is a harbour for weeds. It becomes then a matter of proportion how much is lost. For example, if one hoe in thirteen is missed, it is equivalent to missing one bushel in thirteen, one acre in thirteen, or £1 in £13. In addition, weeds are fostered, and shed their seed for subsequent growth. Good drilling is a matter for pride and economy.—J. E. Harrison, in the Victorian *Journal of Agriculture.*

Farm Forestry.

V. The Native and Introduced Trees of New South Wales.

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The previous articles of this series have dealt with the general question of the value of trees to the farmer and pastoralist, and the methods necessary for their successful cultivation. The present and subsequent articles deal with the native and introduced trees of this State, their botanical features, distribution, soil requirements, general usefulness, and cultivation.

Conditions for tree growth, and, consequently, the nature of the tree flora, vary considerably according to different districts throughout the State. The State has, therefore, been divided into a number of divisions, each of which embraces conditions and tree species which are representative of most districts within that division. The chief factors determining the nature of a tree flora are climatic and soil conditions, and within the State of New South Wales climate is largely governed by elevation, distance from the sea, and latitude.

Divisions of the State.

Based on climatic conditions, the State falls naturally into four main divisions:—

1. Coastal division.
2. Tableland or mountain division.
3. Western Slopes division.
4. Western Plains division.

Each of these divisions may be further divided into certain subdivisions and districts, according to variation in local climatic or soil conditions. The line of divisional separation is necessarily arbitrary, and districts close to such lines may more or less share in the conditions and tree flora of two divisions. As elevation plays such an important part in determining climate, it would appear that the soundest line of demarcation between divisions would be a contour line which may be varied according to the general effect of latitude, or according to special conditions. Generally speaking, such a contour line would gradually change to a greater altitude as it passes from south to north, in order to allow for the more favourable conditions of the northern parts.

Each division will be dealt with in detail, but the broad lines of demarcation may be stated as follows:—

The Coastal division includes all the land lying between the coastline and a contour line on the eastern side of the Dividing Range, varying from about 2,000 feet elevation in the south to 3,000 feet in the north. In certain

parts it may come below these elevations to exclude bleak areas which are more suitably included in the Tableland division. Where the coastal flora ascends the mountains, particularly in the north, the line might rise to somewhat higher elevations. In the Hunter River basin, where a gap occurs in the Dividing Range, the western boundary line of the Coastal division is represented by the 25-inch rainfall line.

The Tableland division is bordered on the east by the Coastal division line mentioned above, and on the west by a contour line varying from 2,000 feet in the south to 2,500 feet in the north, although falling below these altitudes in some parts to include bleak and exposed districts. A break exists in the continuity of this division at the Hunter River basin, where the Coastal division adjoins the Slopes division without the usual intervening tablelands.

The Western Slopes division is bounded on the west by a line varying from about 500 feet in the south to 900 feet in the north.

The Western Plains division.—The remainder of the State is included in this division.

It is proposed to deal with each division in turn, describing the general features and subdivisions of each, the conditions prevailing for tree growth, the requirements of the division from the point of view of tree planting, and giving a description of the indigenous trees with their distribution and uses, a survey of the introduced trees, and a list of species recommended for planting for different purposes.

THE WESTERN PLAINS DIVISION.

This division embraces the whole of the State west of a boundary line varying from about 500 feet elevation in the south to 900 feet in the north. The line commences at about Corowa on the Murray River, passes to Narrandera, then runs a few miles east of Whitton, Condobolin, Warren, Coonamble, and Narrabri, thence passes about midway between Moree and Warialda to finally join the Queensland border.

In relation to the Land Board districts, the division includes part of the western portion of the Wagga Land Board district, a greater part of the Hay district, part of the Forbes district (principally round Condobolin), the western portion of the Dubbo district, the greater part of the Moree district, and all the Western Land Board. The division covers an enormous area, and may be further divided into the far western plains and the nearer western plains, the boundary line being, roughly, a line drawn from Balranald to Bourke and continued on to the Queensland border. The nearer western plains include most of the country with a rainfall of 12 inches and over, although part of the north-western plains lying on the west of this boundary enjoys a somewhat heavier rainfall.

For the purpose of this article, the Western Plains division will deal only with the nearer western portion, as the far Western Plains are so sparsely settled, and conditions so unfavourable for the cultivation of trees,

that it is not desirable to deal with them. For convenience, the nearer Western Plains may be subdivided into the south, central, and northern subdivisions. It is unnecessary to fix a hard and fast line between these subdivisions, but the main centres in the southern subdivision are Hay, Deniliquin, the Murrumbidgee Irrigation Area; in the central subdivision, Hillston, Mount Hope, Condobolin, Cobar, and Nymagee; and in the northern subdivision, Walgett, Narrabri, Moree, and as far west as Bourke and Brewarrina.

The greater portion of the division is flat plain country, but there is a certain amount of hilly or undulating land with scattered sandy or stony ridges. Soils fall roughly into three classes, viz., black, red, and light grey or poor sandy types. The black soils are fairly uniformly deep and rich in plant food. Black soil plains are frequently sparsely timbered, or altogether treeless, and, generally speaking, are not favourable to tree life, being swampy when wet, and hardening and cracking badly after drying. A number of trees, however, such as the Myall (*Acacia pendula*) make excellent growth under such conditions. The red soils are more variable, both in regard to depth and plant food contents, and are usually moderately well timbered. They embrace four main types:—Deep alluvial red soils with a clayey or sandy subsoil; deep æolian red soils with a friable or heavy subsoil; granitic red soils, of 1 to 2 feet in depth, over decomposed granite; and shallow slate red soils of a more or less clayey character.

The rainfall varies from 12 to 27 inches, and has a higher average in the northern than in the central or southern subdivisions. In the south the average rainfall is about 15 inches; in the central subdivision, 12 to 18 inches; and in the north, 18 to 27 inches. In the southern subdivision a number of districts have the benefit of irrigation facilities. The great majority of landowners in this division are engaged in pastoral pursuits, although some agriculture is practised in the eastern portions.

Conditions for Tree Growth.

Speaking generally, conditions in this division are not very favourable for tree growth, mainly on account of the low rainfall and hot dry summers. In most districts artificial watering, except for one or two special plants, is quite out of the question, and considerable difficulty is experienced in establishing any but the hardiest of trees. Drought years, during which the rainfall is reduced to a very few inches, frequently cause the death of partially established trees, and, in extreme cases, kill fully grown specimens. Apart from other pests and diseases, living trees are attacked by white ants, which sometimes cause great destruction. It is therefore most essential that only suitable trees be planted, and that the preparation of the ground and subsequent cultivation be especially thorough to counteract unfavourable conditions.

The naturally occurring tree flora of this division is varied, and, apart from its great botanical interest, includes many species of value to the pastoralist. Quite a number yield useful fodder which help to tide stock over droughty periods. Some species, principally the cypress pines, supply

timber of high value for building requirements, and a fair proportion yield durable timber for fencing, stock-yards, &c. Western trees are also noted for the excellent fuel which they supply. Many species provide fine shade and shelter trees, and belts of standing timber form moderately efficient breakwinds.

From the point of view of tree requirements, the outstanding need of the division is for shade and shelter trees, and for breakwinds and shelter belts. The hot dry summer months and the bleak winds of winter impose severe hardships on stock which have not the benefit of some efficient shelter. In some cases such protection is given by native trees, but in districts where the natural cover has been removed or is too sparse, planting is essential. The conservation of fodder trees and the formation of plantations of these are other outstanding requirements. Going west, fences become less frequent, so that the demand for fencing material is not so great, and can be adequately met from natural supplies. The conservation and planting of shrub and tree life are essential in many parts to prevent soil drift and the formation of "scalded plains." The outstanding need, however, is for shelter trees to secure comfort for man and beast. The planting of ornamental trees, which might also serve as shelter trees, is necessary to relieve the drab dustiness of many western towns and homesteads. The formation of plantations for profit from the sale of timber, &c., is not recommended for this division, although, in some cases, a plantation of trees might be made to yield fencing material and fuel in addition to acting as a shelter belt.

To sum up, it may be said that the Western Plains division is noteworthy for its interesting and useful native tree flora, for the pressing need for conserving or establishing shelter trees, breakwinds, and fodder trees in practically every district, and for the trying conditions imposed on tree growth, making the establishment of all but a few species a difficult matter.

Principal Native Trees of the Western Plains.

The trees described below all occur in the Western Plains division, but, in many cases, extend to the Western Slopes, and in some cases to the Tablelands and Coastal divisions. Generally speaking, however, they are typical of the tree flora of the Western Plains.

WILGA (*Geijera parviflora*).

A small tree widely distributed in western areas, especially on red soils and heavy alluvials.

Leaves narrow, and 3 to 6 inches long; flowers, small, yellowish-white, in short terminal panicles; fruit, two-valved, and the seed hard and shiny.

Uses.—The trees are shapely and ornamental, being usually trimmed round the bottom by sheep. They make excellent shade trees, and are very hardy and drought-resistant. Some trees are readily eaten by stock, and provide useful fodder reserves, but stock refuse to touch others. The non-edible variety appears to be botanically identical with the edible, and there seems to be no distinction in regard to period of growth, soil formation, &c., to

account for the discrimination by stock. It is one of the best trees for conservation and planting in the Western division, and, together with Kurrajong, enjoys a wide popularity.

ROSEWOOD OR BOONERY (*Heterodendron oleaefolium*).

A small to medium-sized tree, but sometimes little more than a shrub. It is also known variously as "Rose Bush," "Apple Bush," and "Whitewood," but the latter name should only be applied to *Atalaya hemiglauca*.

Leaves, entire, and 1½ to 4 inches long; flowers in short, few-flowered panicles; fruit has two to four more or less globular lobes; seeds covered with a red fleshy arillus.

Uses.—A useful fodder tree that stands lopping very well. At times there is a danger from poisoning, especially when the leaves are wet with dew or rain. Very hungry sheep should be fed with caution, and, if possible, other material fed as well. Some cutters adopt the practice of lopping a day before feeding, thus reducing the risk of hoven. Although very often an indifferently shaped tree, it responds well to lopping, making an effective shade and shelter tree. Good specimens, especially if pruned, are decidedly ornamental.

KURRAJONG (*Brachychiton populneum*).

A widely distributed tree, occurring in every division of the State, including the Western Plains division. It is a small to moderately large tree, occurring on a variety of soil types, but perhaps most common on stony, rocky ridges, and frequently showing a preference for limestone formations.

Leaves, extremely variable, being entire or variously divided; flowers, pale coloured, bell-shaped in axillary panicles; fruit, a follicle up to 3 inches long.

Uses.—This is without doubt the most popular tree with landowners in the Western division, being extremely useful as a fodder tree and providing, in addition, good shade and shelter. Its reputation as a fodder tree is well established, landowners conserving this species wherever possible. Owing to its deep rooting habit crops may be grown practically to the base of the trunk. Propagation from seed is not difficult. Fresh seed should be taken from the pods as they ripen, generally in May or June, and sown on well-prepared soil. Young plants should be transplanted early. The seed may also be sown in spots on the permanent site, and the strongest seedling in each case allowed to develop. Fairly well-developed plants can be successfully transplanted during the autumn and winter months. It is generally regarded as slow growing, but if the ground is cultivated regularly the plants make surprising growth. When planting for fodder, care should be taken to pick out plants which have well-developed, undivided or only partially divided leaves, as specimens with very fine, deeply divided leaves will naturally yield less leafy material per tree. The timber is soft, spongy, and practically useless. A tree well worth planting for fodder, shade, shelter, and ornamentation, but, although fairly hardy, does best in those parts of the division which impose the least severe conditions on tree growth.

LEOPARD WOOD (*Flindersia maculosa*).

A small to medium-sized tree with spotted bark due to the outer layers falling off in patches.

Leaves, opposite or nearly so, and 1 to 3 inches long, generally simple, but occasionally lobed; flowers, small, in a terminal panicle; fruit, a hard muricate capsule about 1 inch long, containing flat seeds winged at both ends.

It has an interesting life-history. starting as a tangled growth of long thin branches, and then sending up a main shoot which is protected by the surrounding branches.

Uses.—It has some value as a fodder tree, although not classed among the most useful species. The wood is pale-coloured, and is of little use for general work, being very perishable out of doors. For inside work it appears to last fairly well. It exudes a gum which is soluble in water, and makes a good mucilage.

BELAH (*Casuarina lepidophloia*).

A small to medium-sized tree widely distributed in the Western and Central subdivisions on heavy, more or less alkaline, soils, such as moist flats and depressions, and is usually confined to such areas.

Branchlets ascending; fruit a compact cone about 1 inch in diameter.

Uses.—A useful fodder tree, although the woody and somewhat astringent branchlets have sometimes a bad effect, particularly if fed without a mixture of more succulent species. A useful shade, shelter, and ornamental tree. The timber lasts fairly well in the ground as fencing posts, makes good fuel, and is employed for building rough stock-yards, &c. Readily propagated from seed, and young plants make fairly rapid growth during the first few years.

BULL OAK (*Casuarina Luehmanni*).

A small to medium-sized tree frequently found on a variety of poorer soils, including stiff clays, sandy clays, and sandy loams, and often on ground subject to inundations.

Fruit cones flattened, about ½ inch in diameter, much shorter than those of the Belah.

Uses.—The foliage of this *Casuarina* is inferior to other species of the genus for fodder purposes, being coarse and tough. It makes a fair shade tree. The timber is used for fuel and fencing posts, but is said to split badly as soon as felled.

SUPPLE JACK (*Ventilago viminalis*).

A small to medium-sized tree, 20 to 30 feet high, which generally shows a preference for light drift soils or sandy loams.

Leaves, narrow, lanceolate; flowers clustered along the branches of a short axillary panicle; fruit consisting of a small round nut produced into a long narrow wing, the whole about 1 inch long.

Uses.—Often a rather poorly-shaped tree with sparse foliage, but becoming much more dense after lopping. It suckers freely, and is regarded as a most useful fodder tree, some pastoralists ranking it with Kurrajong. The wood is yellow, soft, pithy, and unimportant.

WHITEWOOD (*Atalaya hemiglauca*).

A small to medium-sized tree with a scaly and friable bark.

Older leaves pinnate, the younger ones entirely or variously lobed; flowers, white or pale-coloured, in axillary or terminal panicles; fruit separating into one-seeded carpels, each one terminating in a long wing.

Uses.—This tree, especially if pruned, is of ornamental appearance, and provides a certain amount of shelter. It is frequently used as a drought

Wild Orange (*Capparis Mitchelli*).

fodder, but recent investigations have shown that it is poisonous to horses, although apparently not affecting other stock. It requires to be fairly common and eaten in quantity to affect horses, and the symptoms may take weeks, or even months, to develop. It has been shown to be the cause of the well-known "Walkabout" disease of horses in the Kimberley district (Western Australia). The timber is pale-yellow or whitish, but is of no value, being soft and perishable, and is subject to attack by borers, &c., almost as soon as cut.

WILD ORANGE (*Capparis Mitchelli*).

A small tree or large shrub, often of bushy and spreading habit, and found chiefly on clayey loams. It begins life as a tangled, thorny shrub, sometimes scrambling up trees by means of its prickles, but soon developing one or more leaders.

Flowers, usually white, solitary, and on long stalks; fruit, a large berry about 2 inches in diameter, borne on a long stalk, and having a pleasant smell when ripe. It is also known as Native Pomegranate.

Uses.—The larger trees provide very useful shade and shelter, forming an attractive, rather dense growth, and they are ornamental in appearance. The timber is pale-coloured, hard, and close grained, but usually too small for general purposes.

Budda (*Eremophila Mitchelli*).

Belah (*Casuarina lepidophloia*).

BEEFWOOD (*Grevillea striata*).

A small to medium-sized tree, fairly widely distributed. Leaves, long and narrow, 6 to 18 inches long; flowers, small and in racemes, 2 to 3 inches long; fruit, a follicle about ¾ inch long, opening along the margin.

Uses.—The foliage is sometimes eaten by stock, but does not provide good fodder. The timber is frequently used for fence posts, &c., and has proved very durable. The flowers are handsome, and the whole tree rather ornamental. It sometimes produces a dark-reddish resinous exudation, which was used by the aborigines as a cement.

BUDDA (*Eremophila Mitchelli*).

A small tree or shrub, generally with sparse foliage. It grows commonly on sandy ridges or on shallow soil over clay in company with the Bimble Box (*Eucalyptus populifolia*), especially in the North-western division.

Leaves, narrow, and 1 to 3 inches long; flowers, solitary, or sometimes in pairs, white or purplish, sweet-scented, about ¾ inch long, and woolly inside; fruit, a dry drupe, separating into four nuts.

Uses.—The timber is moderately light, very tough and white-ant resistant, being commonly used for fencing posts in the round. It makes good fuel, burning with a sweet and pleasant odour. No use for fodder purposes.

EMU BUSH (*Eremophila longifolia*).

A shrub or small tree.

Leaves, 4 to 6 inches long or more; flowers, solitary or in pairs, about 1 inch long, dull reddish colour, tomentose; fruit, a small succulent drupe, nearly black.

It should not be confused with several other species which are sometimes known by the same vernacular name.

Uses.—When well grown it is useful as a shelter and ornamental tree. It furnishes a certain amount of useful fodder. The native Fuchsia (*Eremophila maculata*), which is poisonous to stock, is fairly closely related botanically to this species.

QUANDONG (*Fusanus acuminatus*).

A shrub or small tree.

Leaves, usually opposite, pale-coloured, 2 to 3 inches long, with a short curved point; flowers small, in cymes or panicles; fruit, a bright red succulent drupe about ¾ inch diameter.

Uses.—The fruit is edible, and is often much sought after. The timber is pale-coloured, hard, close-grained, and of fairly good quality, but too small for most purposes. Useful as an ornamental or small shade tree, and with some value as a fodder

GRUIE OR COLANE (*Owenia acidula*).

A small tree with a milky juice, frequently found on sandy ridges.

Leaves, pinnate and resembling those of the Pepper tree (*Schinus molle*); flowers, small, in axillary panicles; fruit, a red globular drupe.

Uses.—The tree is very ornamental, provides good shade, and is useful as a fodder. It is well worthy of planting, but the seeds are difficult to germinate under ordinary propagating conditions. The fruit is eaten to some extent, having a sub-acid taste, and said to relieve thirst.

BERRIGAN, BUTTER BUSH, OR LITTLE WHITEWOOD (*Pittosporum phyllyraeoides*).

A shrub or small slender tree with drooping branches, usually found in dry ground.

Leaves, narrow, thick, 2 to 4 inches long; flowers, yellow, solitary or clustered; fruit, a yellow capsule with thick, hard valves, opening to show very viscid orange-red seeds.

Uses.—It provides fair fodder, and is useful for small breakwinds, hedges, and ornamental work. The timber is close-grained, light in colour, very hard, and of some use for small purposes, such as the making of tool handles.

CURRANT BUSH OR WARRIOR BUSH (*Apophyllum anomalum*).

A shrub or small tree with pendulous, almost leafless, branches, usually found on clayey æolian loams.

Flowers, fragrant, solitary, or in short racemes or clusters, whitish; fruit, a small berry about the size of a pea.

Uses.—Very hardy and drought-resistant, and when well grown makes a good shade and shelter tree. On poorer soils it is very often reduced to a small shrub. It has some slight fodder value, but only of a low order.

Currant Bush or Warrior Bush (*Apophyllum anomalum*)

WILD LEMON (*Canthium oleafolium*).

A shrub or small tree, confined mainly to red soils and sandy ridges.

Leaves, oblong, and 1½ to 3 inches long; flowers, white, in axillary cymes or clusters; fruit, a drupe, somewhat globular.

Uses.—It provides fair fodder during droughty periods. Sometimes known as Myrtle tree.

QUININE (*Alstonia constricta*).

A small to medium-sized tree with a milky juice, and usually found on higher ground, avoiding the flats. It appears to do best on sandy loams.

Leaves, on long stalks, and opposite; flowers, yellowish, numerous in cymes; fruit, linear, 3 to 8 inches long, dehiscing to free the seeds, which are covered with long hairs.

Uses.—It is useful for shade and shelter purposes, and the bark, which is very bitter, has medicinal uses. It is said to possess valuable febrifugal and tonic properties.

HORSE RADISH TREE OR MUSTARD TREE (*Codonocarpus cotinifolius*).

A tall shrub or small tree, generally growing on red soils or sandy loams. It is a slender-growing, rather graceful tree, and is sometimes known as "Native Poplar."

Flowers, usually unisexual, and arranged in a ring round a central disc; fruiting carpels joined together round a central column, forming a bell-shaped fruit, separating when ripe; leaves, often broad.

Uses.—The bark and leaves have a very pungent taste, giving rise to the common names attached to the tree. Stock will not touch it except in very bad seasons, and then only sparingly. The timber is very light, soft, yellowish in colour, and fairly strong-smelling. It is a free-seeding tree, and when growing in the open produces young plants in abundance.

White Cypress Pine (*Callitris robusta*)

NEEDLEWOOD (*Hakea leucoptera*).

A small tree or shrub, usually found on dry sandy ridges and poorer soils, but also extending to better class soils.

Leaves, cylindrical, needle-like, and 1½ to 3 inches long; fruit, woody, opening in two valves; seeds, winged.

Uses.—It provides a poor class of famine food for stock. The root stock makes excellent material for pipe manufacture.

WHITE CYPRESS PINE (*Callitris robusta*).

A widely distributed tree, especially on good sandy loam soils. It is a deep-rooting species, avoiding a stiff impermeable subsoil, and preferring dry soil away from damp river flats.

Foliage generally has a glaucous tint; fruit, a small cone containing winged seeds; male flowers in catkins at the ends of branches.

Uses.—Although a useful shelter tree, it is mainly valued for its timber. This is durable and white-ant resistant, and is largely used for house construction, flooring boards, fencing, &c. It is in great demand commercially, many of the more accessible areas having been cut out.

It provides, perhaps, the most useful timber of the Slopes and Plains divisions, being of material assistance to the settler in the development of the country. Sometimes when land is cleared of this pine a dense growth of seedlings results, which, if allowed to develop unchecked, forms dense scrubs which not only provide an obstacle to settlement, but shelter vermin. It is a good tree for maintaining in belts, providing not only a supply of timber, but also acting as breakwinds, &c. The timber may be used for fuel, but tends to burn too rapidly, and is inclined to be sooty. A slow-growing species under western conditions, but grows much more rapidly in the Coastal division when planted artificially.

BLACK CYPRESS PINE (*Callitris calcarata*).

A widely distributed tree, but generally on hills or stony ridges, preferring deep, well-drained sandy soils. It resembles the White Pine, but the foliage is generally greener, and it is more confined to stony hillsides, &c. The timber is considered to be inferior to that of the White Pine, but has the same general usefulness. The tree is useful for shelter purposes.

Another Cypress Pine of the Western Plains division is the Mallee Pine (*Callitris verrucosa*). This is a shrub or very small tree, or Mallee-like growth, and with characteristic warts or tubercles on the fruit cones. It is too small for general usefulness.

Other trees or shrubs represented in the Western Plains flora include the Dogwood (*Myoporum deserti*), Sandalwood (*Santalum lanceolatum*), and Youngie Bush (*Melaleuca uncinata*).

(To be continued.)

INFECTIOUS DISEASES REPORTED IN JUNE.

THE following outbreaks of the more important infectious diseases were reported during the month of June, 1928:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	23
Piroplasmosis (tick fever)	Nil.
Blackleg	5
Swine fever	12

—MAX HENRY, Chief Veterinary Surgeon.

MILK is relatively cheap on the farm. The farmer's family should use it more liberally in cooking and as a drink. Such an increased use of milk is economical, and leads to better health on the farm.

Painting on the Farm.

N. L. JONES, Supervising Architect.

It is important that at least certain fundamentals pertaining to painting be thoroughly understood if satisfactory results are to be obtained even in comparatively simple cases. It is often noticeable that where successive coats of paint have been applied by amateurs, the surface is in such condition that to bring it back to a satisfactory state often costs more than the actual painting. It is not sufficient to merely stir up a tin of ready-mixed paint and spread it on the walls or whatever is being painted.

Painting is a comprehensive subject which calls for much study in order to gain a thorough knowledge of all its branches. It is possible, however, for the average person to do creditable work by giving a little consideration to the subject. It is with this object, and also with the idea of assisting the man on the land, who, by reason of his comparative isolation, can only secure skilled labour at exceedingly high rates, that this article is written.

It is, in the first place, necessary to consider the class of material it is proposed to paint—whether wood, iron, cement, plaster, brick, &c. Consideration has also to be given to the condition of the surface it is intended to paint—whether it has been painted previously, and if so, whether it has a good smooth unbroken surface, or whether it is cracked, blistered, or peeling. It may be that the old paint is tacky, and has considerable dust hanging to it. Consideration of these conditions determine the preparatory work essential for satisfactory results, and the composition of the paint to be used, which, in a general way, may include linseed-oil paint, cold-water paint, kalsomine, varnish, &c. By linseed-oil paint is meant a paint in which linseed oil, together with a thinner, forms the distributing agent for a base of finely divided pigment, such as white lead, red lead, zinc oxide, or titanium zinc, and to which may or may not be added colour pigments called stainers.

Linseed Oil.

Linseed oil is, for many reasons, the oil mostly used for house painting, its function being to hold the pigment in suspension and enable it to be evenly distributed over the surface. Subject to certain conditions, it dries in an insoluble film, thus binding the particles of pigment together. Linseed oil varies somewhat in quality, and, although possessing valuable properties, it has one great defect in that special preparations have to be added to it to give it the drying properties it seldom in itself possesses.

Good fresh oil should be clear and pale and emit very little odour. There are two kinds of linseed oil, viz., raw and boiled. Boiled oil is now not used to the same extent as formerly. It is suitable for some purposes, but for painting generally raw linseed oil is the correct material to use.

Thinners.

These are added to make the paint more mobile, *i.e.*, they thin the paint according to the quantity added, thus making it work more freely. For this purpose, genuine turpentine is of proven worth, but as its cost has of late years increased considerably, petroleum or white spirit is sometimes used as a substitute. These thinners ultimately evaporate and, therefore, take no part in the final composition of the paint.

The addition of turpentine tends to cause the paint to dry with less gloss; thus, if the pigment were mixed with turpentine to the exclusion of linseed oil, the paint would be quite flat, i.e., without gloss. If, on the other hand, linseed oil only were used, the paint would dry with a glossy surface which, in most cases, causes subsequent coats to run together in blobs or patches, which action is called cissing. It will be seen, then, that the purpose of adding turpentine to the paint may be a threefold one, viz., to thin it down so that the paint will sink in and thus provide a good foundation, to produce a flat finish, and also to prevent cissing. It is for this reason that in tables which give the proportions of ingredients for mixing paint for three-coat work, the second coat contains the greatest quantity of turpentine and the final coat considerably less.

Driers.

Linseed oil does not possess sufficient drying properties in itself, and, therefore, driers are added to make up this deficiency. These must be used with caution, however, as in addition to carrying oxygen to the oil, they also tend to burn it up. As will be readily understood, paint requires less driers in warm weather than in cold damp weather, which fact applies equally to external and internal painting.

Two driers in common use are Patent driers and Terebene. The latter is very powerful as may be judged from the fact that one ounce will cause one pound of paint to dry in about half an hour. This is a danger to the durability of the work. Not less than forty-eight hours should elapse between each coat, and provided that only sufficient driers are added to cause the paint to dry hard within this period, good work will result.

The Base.

White Lead.—Until recently, white lead ground in oil was the standard material for general painting. Its poisonous properties have given rise to world-wide complaint and dissatisfaction by operative painters. Another great defect is that when used by itself, that is, without stainers, it tends to become chalky upon exposure, particularly along the coast, and it is not an uncommon thing to find work that has been done by painters little better than whitewash. The addition of pigment (or stainers) corrects this defect, while for surfaces which are to be finished white, the addition of one part zinc white to three parts of white lead will produce satisfactory results. This is the composition of some of the better brands of ready-mixed white paint.

Zinc White.—This is a zinc oxide and similar in appearance to white lead. Compared with this latter material it lacks opacity, in that ordinarily three coats of white lead are equal in covering power to four or more of zinc white. Zinc white dries very hard and for this reason should not be used by itself on external work as it will crack badly, and cracked paint is costly in that it must be burnt off if further painting is to be done satisfactorily.

Titanium Zinc.—This is a comparatively new material which is gradually gaining in favour. Titanium is an inert, and, therefore, non-poisonous material, but because of its inertness it will not dry if used by itself. By mixing it with zinc oxide, however, the inertness of the one is corrected by the hard-drying properties of the other, and because of the extraordinary opacity of titanium, the resultant mixture possesses covering properties far greater than that of white lead. It is a consideration, also, that because of the number of gallons of paint that can be made from a hundredweight of titanium zinc paste, the cost per gallon of such paint is no more than if made with other pastes, notwithstanding that the cost per hundredweight of titanium zinc may be greater.

For painting, the foregoing pastes should be bought in paste form, i.e., ground in oil. As these pastes deteriorate if exposed, they should be kept covered with oil or water once the container is opened.

Red Lead.—Unlike the other bases, red lead is bought in powder form. It has many uses, but for general painting is chiefly used as a primer or first coat. Mixed with titanium zinc, it works well and provides a splendid foundation for further coats.

HOW TO MIX PAINTS.

The skilled painter regards as indispensable an adequate supply of paint pots of convenient size and shape. The amateur will soon appreciate the benefit of following his example. He should also see that they are perfectly clean before putting paint into any of them. The easiest way to clean old paint pots is to set fire to them.

It is advisable to mix first the white paint, that is, the base, linseed oil, thinners, and driers. Then mix the stainers together on a flat slab, and afterwards add these to the white paint, stirring the whole until the required tint is obtained. It is better to add only a little of the stainers at a time; thoroughly stir and brush-out on a piece of timber to ascertain if the desired tint has been obtained. If a lot of colour is added to start with, the paint when stirred up and brushed-out may prove to be so dark as to require a considerable addition of white paint, with the result that the batch is far in excess of the quantity required. If, for any reason, there does happen to be an excess, do not try to change its colour by adding a lot of other stainers, because if too many stainers are used the result is likely to be a monotonous drab rather than a pleasing tint. After the batch has been well stirred, it should be strained through a clean piece of singlet

or stocking spread across the pot and tied in position. For house painting the amateur should never be in such a hurry as to neglect the little extra time involved in straining.

It is assumed that the mixing of the paint would not be commenced until it was actually needed, for, unless kept in an air-tight container, mixed paint tends, upon exposure for any length of time, to become fatty, and this causes cissing when being brushed-out.

Pigments.

The following pigments or stainers are used for the common colours in house painting:—

Stone Colour.—Burnt Turkey umber, raw Turkey umber, yellow ochre.

Drabs.—Burnt umber and yellow ochre.

Buffs.—Yellow ochre and Venetian red.

Greys.—Lamp black, Indian red, ultramarine blue, vermilion.

Brown.—Burnt sienna, Prussian blue, yellow ochre.

Greens.—Brunswick green (dark and light), with blue and chrome yellow.

These should always be ordered "ground in oil."

White Lead Paint.

To make 1 gallon of white paint with white lead pastes:—

Priming Coat.—Mix 21 lb. white lead paste, 1 lb. dry red lead, 3½ pints raw linseed oil, 1 pint turpentine, and 12 oz. patent driers.

Second Coat.—Mix 23 lb. white lead paste, ½ gallon raw linseed oil, ½ gallon turpentine, and 1 lb. patent driers.

Finishing Coat.—Mix 23 lb. white lead paste, 3 pints raw linseed oil, ½ pint turpentine, and 1 lb. patent driers.

White Titanium Zinc Paint.

To make 1 gallon of white paint with titanium zinc paste:—

Priming Coat.—Mix 9 to 10 lb. titanium zinc paste, 1 lb. of dry red lead, 4½ to 5 pints of raw linseed oil, 1 pint of turpentine, ½ to 1 oz. of terebene driers.

Second Coat.—Mix 10 lb. of paste, 1 to 1½ pints raw linseed oil, 2 to 3 pints turpentine, ½ to ¾ oz. terebene driers.

Finishing Coat.—Mix 10 lb. titanium zinc paste, 5 pints raw linseed oil, ½ pint turpentine, ½ oz. terebene driers.

It is important to note that patent driers should not be used with titanium zinc paint, or, for that matter, with any zinc oxide paint. Terebene, if used in the proportions given above, is suitable. If desired, a reliable brand of zinc driers may be used.

Whilst the quantities given above will suit most cases, they will not meet every known condition; for instance, if the wood is very hard, a little less thinners (turpentine) will be required for the first coat, while if it is unusually absorbent, a little more may be added with advantage.

A gallon of paint mixed according to the foregoing instructions, and in the proportions given above, will cover from 650 to 850 square feet, depending on the condition of the surface. To determine the quantities of materials for any job, it is, therefore, only necessary to divide the total square feet of surface to be painted by the average spreading power of the paint, say, 750, and multiply this by 2 or 3 according to the number of coats to be applied. This will give the total number of gallons of paint, from which the quantities of the ingredients can be computed.

Paint Brushes.

Painting broad surfaces with a small brush is slow and tiring, while to attempt cutting in window sashes, small mouldings, &c., with a large brush is slovenly. For broad surfaces, a 3½ or 4 inch flat wall brush is recommended, and for mouldings, &c., a 1½-inch flat varnish brush. A flat soft brush for dusting is almost indispensable.

Brushes of quality will, of course, cost more than the inferior article, but their cost is more than compensated for by the speed, the appearance of the work, and the general satisfaction which they afford.

It is advisable first, to soak a new brush in water for a few hours to tighten up the bristles in their binding. Care should be taken, however, to see that they are quite dry before painting. They should not, when out of use for lengthy periods, be left in water or even in pure turpentine, as this robs the bristles of their elasticity. A good method is to bore a hole through the handle, and by means of a piece of wire suspend the brush in a mixture of equal parts of linseed oil and turps. After use a brush should be washed in turpentine, soap and water, or even a patent varnish remover.

Painters' Gear.

Painting broad surfaces, such as walls, from a ladder is tedious, and does not tend to good work. An effort should always be made to work comfortably, and for ordinary buildings, such as cottages and sheds, a couple of planks supported by trestles constructed with 3-inch by 1-inch battens will make possible the painting of the walls, guttering, eaves, ceilings, &c., with a minimum of effort, proper control of the brush, and a proper perspective of the brushing-out.

(To be continued.)

The "Tail" of the Dairy Herd.

In every herd there are to be found some cows that compare unfavourably with their higher-producing sisters. The better the herd the smaller this tail may be, but it is always present, and when located it should be lopped off, as its presence not only indicates but ensures heavy financial loss to the farmer.—L. T. MacInnes, Dairy Expert.

"Classing the Clip."

Appearing at a time when the get-up of the Australian clip, and the alleged deterioration in the quality of our wool, are being widely discussed, Mr. C. E. Cowley's book, "Classing the Clip," will go far to satisfy the ever-increasing demand for information relative to the preparation of wool for market.

The author fully recognises the limitations of a text-book as a medium of acquiring a thorough knowledge of such a practical subject as wool classing, but next to practical training there is nothing which can impart so much useful information as a book written by an author who knows his subject. And Mr. Cowley possesses that qualification, having had twenty years' experience with the Sheep and Wool Department of the Sydney Technical College.

His book deals very thoroughly with wool and its different characteristics, being, in the main, a reproduction of the author's lectures at the Technical College, and should, therefore, prove a valuable textbook for the student. It is also written with the object of affording the sheepman an opportunity of supplementing the knowledge he has gained from practical experience, and consequently assist him in the production of a better type of wool.

In the section of the book detailing the classing and preparation of clips for market, large clips are very fully dealt with and a range of classes described which will not often be found in the one clip. Although it would very rarely be necessary to make so many lines as suggested, particularly as regards crossbred and comeback clips, where it is doubtful if there are flocks of sufficient size to merit so many divisions, still it is presumed that the author's intention was to be exhaustive in his treatment of the subject and cover all contingencies. The tendency to-day in crossbred flocks is to eliminate the stronger-woolled sheep, as they produce the lowest-priced wools, and by so doing lessen the classes necessary at the subsequent shearing.

Although the subject matter is mainly confined to wool classing, a brief description, accompanied by plans, is given of shearing sheds and drafting yards. In the plan of the small shearing shed the position of the fleece bins will not appeal to the classer or presser. And a drafting race 2 feet wide throughout its full length will be found to be too wide; one about 16 inches at the exit is sufficiently wide for ordinary purposes. However, these are small items, and the main subject, wool classing, is excellently treated.

The book runs into 186 pages, and a feature of the make-up is a number of remarkably good illustrations of the various lines and spinning qualities of different wools.

Our copy from the publishers, Messrs. Angus and Robertson, Ltd., Sydney.

Advantages of Citrus Bud Selection.

Great attention has been paid during the last twelve years to the selection of both budwood and rootstock, with the result that orchards that have been propagated with regard to these two factors are made up of trees of uniform size and type, and bear heavier crops of more uniformly good fruits than comparative orchards planted with ordinary trees.—From the Report of W. Ranger, General Manager, Direction of Fruit Marketing, Brisbane.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Potatoes—	
Brownells	J. B. Howell, Glen Innes.
Carman	Johns Brothers, Strathalbyn, Myrtleville.
	M. Hoare, Myrtleville.
Early Manistee	J. J. Cusack, Stonequarry, Taralga.
	R. E. Ball, Stonequarry, Taralga.
Factor	R. E. Ball, Stonequarry, Taralga.
	E. McAlister, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
	K Bowen, Springside, via Orange.
	N. C. Peters, Pinnacle Road, Orange.
Great Scott	J. B Howell, Glen Innes.
Langworthy	N. C. Peters, Pinnacle Road, Orange.
Satisfaction	J. J. Maloney senior, Stonequarry, Taralga.
	M. Hoare, Myrtleville, Taralga.
	C. N. Hillen, Taralga.
Scott's Satisfaction	J. B Howell, Glen Innes.
Up-to-Date	Johns Brothers, Strathalbyn, Myrtleville.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Marglobe	Manager, Experiment Farm, Bathurst.
Sunnybrook Earliana ...	A. E. Johnston, Hoxton Park, via Liverpool.
Broom Millet	Manager, Experiment Farm, Coonamble.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Maize—	
Wellingrove	Manager, Experiment Farm, Glen Innes.
Grasses—	
Sudan Grass	Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.
	Manager, Experiment Farm, Nyngan.
	Manager, Experiment Farm Coonamble.
	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Trangie.
Sweet Sorghums—	
White African	Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.
Sumac...	Manager Experiment Farm, Bathurst.
Saccaline	Manager, Experiment Farm, Lismore.
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.

Grain Sorghums—

White Yolo ... ... Manager, Experiment Farm, Bathurst.
Feterita ... ... Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kyong School, Moss Vale	2	3 Aug., 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 " 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 " 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	113	20 " 1928
Department of Education, Mittagong Farm Homes	30	22 " 1928
Sacred Heart Convent, Bowral	11	23 " 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 " 1928
Marist Brothers' Training School, Mittagong	80	25 " 1928
Blessed Chanel's Seminary, Mittagong	3	26 " 1928
Walaroi College, Orange	4	2 Sept., 1928
J. L. W. Barton, Wallerawang	16	11 Oct., 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	19 " 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 " 1928
Department of Education, Hurlstone Agricultural High School	38	10 " 1928
Department of Education, Eastwood Home	16	16 " 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 " 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 " 1928
Lunacy Department, Callan Park Mental Hospital	20	26 " 1928
Miss Brennan, Arrankamp, Bowral	24	29 " 1928
—. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 " 1929
New England Girls' Grammar School, Armidale	17	12 " 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 " 1929
Lunacy Department, Kenmore Mental Hospital	99	17 " 1929
Tudor House School, Moss Vale	6	22 " 1929
Lunacy Department, Orange Mental Hospital	8	22 " 1929
Australian Missionary College, Cooranbong	57	24 " 1929
William Thompson Masonic Schools, Baulkham Hills	29	28 March, 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 " 1929
P. F. Mooney, Calala	33	16 " 1929
Department of Education, Gosford Farm Homes	16	16 " 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 June, 1929
Dominican Convent, Moss Vale	4	26 " 1929

—Max Henry, Chief Veterinary Surgeon.

Cheese Has a High Nutritive Value.

From the standpoint of the housekeper, cheese is of importance because of its high nutritive value, particularly its high percentage of protein or muscle-forming materials, because of the ease with which it can be kept and prepared for the table, and because of its appetising flavour and of the great variety of ways in which it can be served.—Dr. C. F. Langworthy, United States Department of Agriculture.

Poultry Notes.

AUGUST.

E. HADLINGTON, Poultry Expert.

EACH year as the hatching season progresses, heavy mortality is experienced among chickens on some farms. This season is no exception, and already a number of cases have come under notice where considerable losses have been sustained. In addition, there are poultry farmers who sustain losses without seeking the aid of the Department, and it is not until afterwards that some of these cases are made known, and then it is too late to do anything.

Many farmers are not aware that the advice of Departmental officers is available, and that where necessary a visit will be made to investigate troubles, or, for that matter, give advice on any phase of operations. Others, who are aware of these facilities, do not know that all such services are given free of charge. That much mortality could be avoided if the assistance of the Department was sought is borne out by the scores of farmers who have benefited, either by visits or correspondence.

Faulty Brooding Systems.

One of the main factors responsible for the heavy mortality among chickens is unsatisfactory brooding equipment. Some of the chief essentials in a brooding system were dealt with in a paper read by me at the recent Poultry Farmers' Conference at Hawkesbury Agricultural College, and which was published in last month's "Notes." It is now proposed to deal with some of the common errors made in the installation and working of brooders.

It is quite well understood that there are many farmers who, through lack of funds, are unable to provide the equipment they would like, and, consequently, are working under difficulties. On the other hand, in some instances greater expenditure is incurred on other parts of the farm than on the brooders, to the detriment of the most important stage—the rearing of the chickens—upon which the whole future of the farm depends. Again, others have a good system installed, and perhaps through some fault in the installation heavy losses occur, with the result that the plant is condemned. In many such cases the fault could have been pointed out immediately if the trouble had been brought under notice.

Just one of many similar instances may be quoted as an illustration. A beginner had a hot-water circulating brooder installed by a firm of plumbers. Naturally, having engaged plumbers who professed to know how to fit the system up properly, he considered it should be right. Therefore, when the chickens began to die he looked for causes other than the incorrect installation of the heating system. The losses continued throughout one season and again the following season. The case was recently brought

under notice, and a visit revealed a most amazing state of affairs. The boiler was capable of working more brooders than were installed, yet through being wrongly fitted up it was not possible to obtain the required temperature. The installation was faulty in almost every particular; for instance, the bottom of the boiler had been sunken about 6 inches below the main floor level, and the pipes had a rise to the end of the brooders farthest from the boiler, at which end an exhaust pipe was fitted. Then on the forward pipe, close to the boiler and at the highest point of the system, was fitted a water supply tank. The result was that when a good fire was made in an endeavour to obtain the required temperature, the water in the tank overflowed, due to expansion and to the steam trying to escape at highest point, and poured down upon the boiler. The whole installation was a confusion of ideas, and was utterly incapable of working satisfactorily.

The illustration hereunder shows the correct method of installing the boiler on the floor level system:

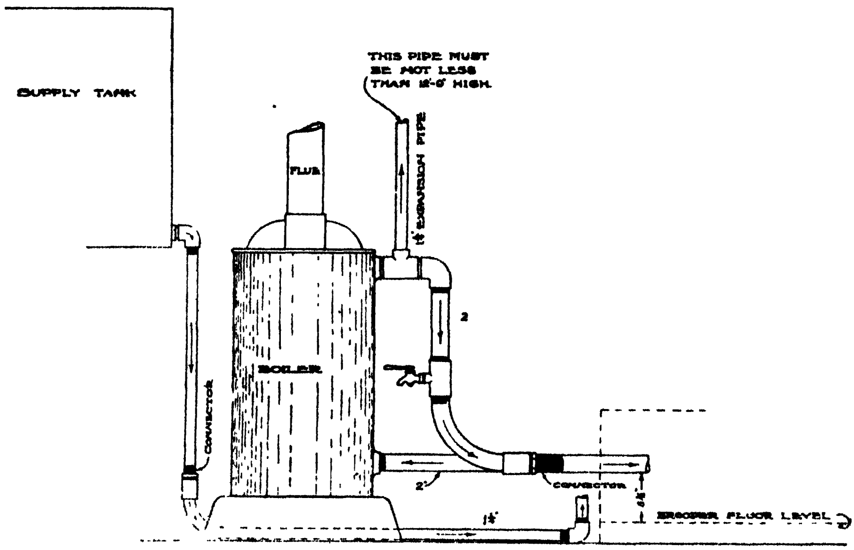


Diagram of a Boiler Installed in the Hot-water Circulating System for Heating Brooders.

A hover type of brooder had been installed, galvanised-iron being used at first for the covering, which is most unsatisfactory owing to its inability to retain an even tmeperature, but this had been replaced by 3-ply wood, which was an improvement, but not thick enough to ensure the desired warmth. The result was that the chickens in the brooder were sick and a number had already died.

Hover Brooders.

The fact that hover brooders are more easily constructed and cheaper to instal than the box type of brooder makes for their popularity among those installing the hot-water circulating system. If properly constructed and operated they are quite successful, but for general management the box

type has many advantages. For instance, the cleansing can be done from a passage instead of having to go into the runs, and at night it can be seen at a glance if the chicks are comfortable without disturbing them. Again, the young chickens have only to be controlled on the one side to prevent their straying away from the brooder and getting chilled, whereas in the hover type they have to be kept from wandering on two sides. These and other small points will be appreciated by those who have had experience in working the two classes of brooders.

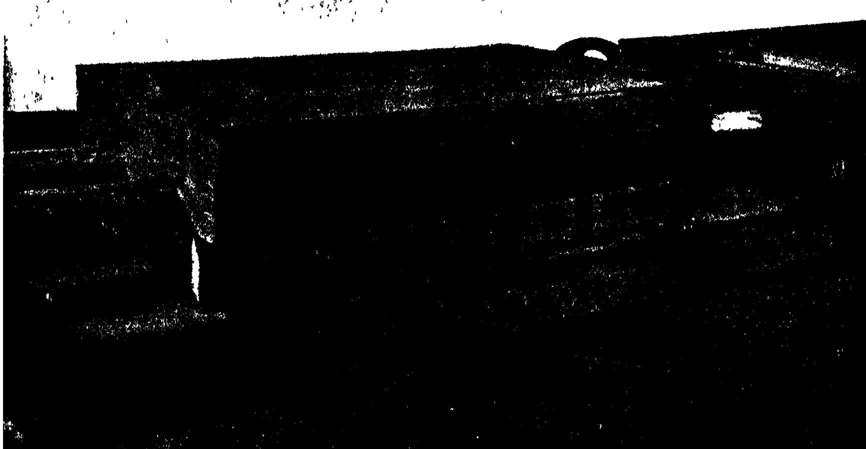
However, as intimated above, the hover brooder is becoming popular on account of cheapness, but many faults in construction are observed, and a few points on this matter may be helpful.

Construction.

Wood is the most satisfactory material for making hovers, and it should be at least ¾ inch thick. It is a good plan to cover the top of the hover with roofing material, such as malthoid, to facilitate cleaning and to cover any cracks which will inevitably occur in any timber.

The size of the hover is the next important consideration, and in this connection there is no general standardisation; in fact, every farmer appears to have some different idea of size, the result being that one sees all sizes and shapes, many of which are, to say the least, unsatisfactory, and can only result in losses.

There is a tendency to construct hovers to accommodate as many as 150 to 200 chickens, but such large hovers as these require more skill in operation than those of smaller capacity, and, therefore, cannot be regarded as a safe proposition for general adoption. The ideal size is one which will accommodate about 100 chicks. The accompanying illustration depicts a suitable type of hover for that number. The dividing fence between the two hovers is not shown.



Hover Brooder.

Plans of this hover can be obtained on loan from the Department, and the hovers themselves can be seen in operation at the Government Poultry Farm, Seven Hills. The dimensions are as follow:—Length, 3 feet 6 inches; width, 25 inches; depth of tray, 7 inches. A curtain of heavy material, such as check Kersey, which is used for lining horse collars, should be hung just clear of the floor on both sides, and on both ends of the hover. This material is best slitted every 2½ inches. It is important that the right class of material be used for the curtain, because if a light flannel or cloth is used it soon becomes twisted and allows too much heat to escape. The worst kind of curtain is that of hessian or sacking, which is frequently used for cheapness, but a few extra shillings would be well spent in obtaining the best material.

Another point in the installation of hovers is that they should not be placed close to the dividing runs. A space of about 9 inches should be allowed between each end of the hover and the dividing fence. This will keep the chickens from getting up against the side of the run and crowding, and will allow room for them to spread out all around the edges of the hover if the temperature happens to be too high.

Still another common fault often observed is that the hover is made of boards placed flat on the pipes, leaving no space above the pipes, consequently the air is not as good underneath as if a space of several inches were left between the pipes and the top of the hover.

Next comes the floor underneath the hover. This should be of wood nailed to cleats on the underside to allow a current of air to pass under the floor. A covering of malthoid should be placed on the wooden floor, and a light coating of sand on this will facilitate cleaning and keep it sanitary. The bottom of the pipes should be 5½ inches above this wooden floor. Against the ledge formed by the raised floor on each side is placed a sloping ramp about 12 inches wide. This is essential to prevent the chickens—if they are forced outside at night—getting behind a ledge and remaining there.

Upright, moveable boards, 12 inches high, are also necessary to place near the hover for the first few days to prevent the chickens straying away from it. It is a good plan also to place these boards up to the ramps at night for a week or more.

The floor of the brooder house should, of course, be of concrete, and a light covering of clean sand is all that is necessary to make cleaning easy.

Plenty of Warmth.

One of the main essentials in working heated brooders is to maintain sufficient warmth to prevent the chickens crowding. Where they can move away from the heat it matters not if temperature goes higher than is really necessary. It is just as important also to keep up the temperature in the daytime so that the chickens can get warm quickly whenever they wish to. For this reason a thermometer should be placed in about every second brooder or hover, or, at any rate, in every compartment where there are

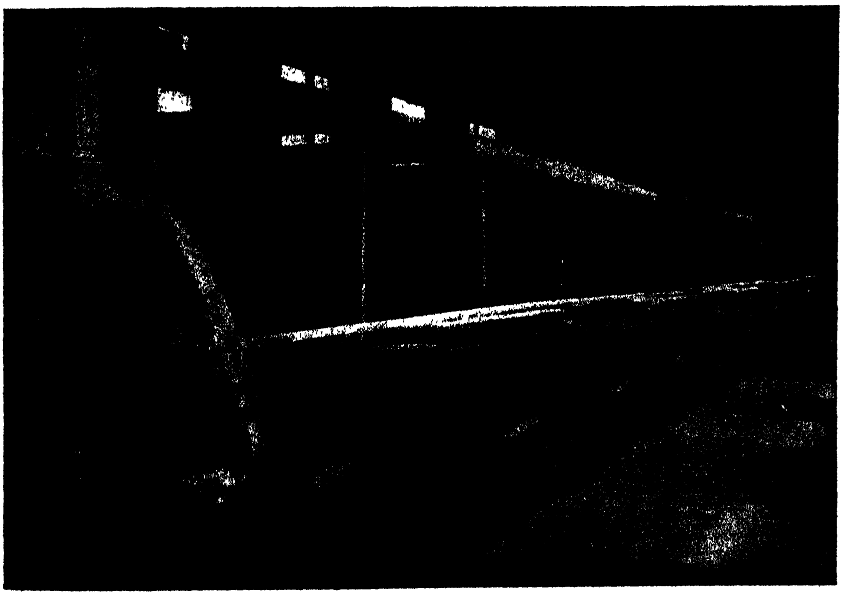
chickens of a different age. The following is a guide to the temperatures required for the ages of chickens specified:—

First week—95 to 90 degrees Fah.
Second week—90 to 86 degrees Fah.
Third week—86 to 82 degrees Fah.
Fourth week—82 to 78 degrees Fah.
Fifth week—78 to 74 degrees Fah.
Sixth week—Wean off heat.

In the cold weather it is preferable to keep the chickens in the brooders a week longer.

Exposure to Cold Winds.

A practice that leads to trouble on some farms is that of allowing small chickens to run out in the cold winds. It is far safer to keep them shut in when there is a cold wind blowing, and only leave them out while the sun is shining with some warmth on the runs.



Box Type of Brooder.

Stoke Up Early.

A time when much trouble is caused among chickens is when they go up at night. If the brooders have been allowed to cool down during the afternoon and the temperature has not been brought up to the necessary degree the chickens will crowd together to get warm. The cooler the brooder the longer they will crowd, and when they pack together for half an hour or so they begin to sweat. When this occurs it will continue long after the brooder temperature is brought up again, and very often the sweating goes

on most of the night, because, when once the chickens have become sweated, the down on them and also the floor of the brooder become damp, and as soon as the chickens move apart the cold air strikes them and they crowd again. This continues and the damage is done in one night.

In working a hot-water circulating system, or, for that matter, a coke-heated colony brooder, a regular time should be fixed daily for cleaning out the heater. The best time is about an hour before the chickens go up at night; this allows the brooders to become thoroughly warmed up beforehand. In doing this a long poker half an inch thick, with the end turned up about 3 inches and flattened to go between the bars, is the best tool. This should be thrust to the back of the fire just on top of the bars, and worked round one side of the boiler with the turned end of the poker to the side, then repeating the same operation on the other side to clear all the ashes and cinders from the ledge above the bars. It is necessary, too, to keep the ashes cleaned from underneath the bars, otherwise they will soon buckle with the heat. After cleaning out the boiler, only a small quantity of coke should be put on until the heat is well up. Even then only sufficient should be added to have the boiler half full when the last stoking for the night is done. The last stoking is best done about 10 o'clock, and before filling up another clearing out should be given, but care must be exercised not to disturb the fire to such an extent that it may go out. If these directions are followed a good clean fire is assured for the night. If, on the other hand, the boiler is nearly full of coke before the final stoking, a larger proportion of partly spent fuel will be left in, and the fire will not be as satisfactory.

Our Debt to Rothamsted Experimental Station.

Rothamsted Experimental Station, of which our recent distinguished visitor, Sir E. John Russell, O.B.E., D.Sc., F.R.S., is the director, has, by the invention of superphosphate, placed the whole world, and particularly Australia, in which country this fertiliser has enormously increased the yield of wheat and various other crops, under a debt of gratitude.

Rothamsted is world-famous as an agricultural research station, and was founded by Sir John Lawes in 1843, who was assisted by J. H. Gilbert, a soil chemist. Upon the deaths of these two great scientists—they both died within a very short interval—the research station was administered by a trust, and the first director under the trust was Sir Daniel Hall, who was succeeded in 1912 by Sir John Russell.

The researches carried out by these distinguished men, and the meticulous care with which they have co-related the field work of the station with laboratory investigations, have made it possible to give to the world explanations of many of the fundamental principles underlying the practice of agriculture. And if ever there is to be a day when there will be a world-shortage of foodstuffs, we cannot but help feeling that the progress in agricultural methods as the result of the work at Rothamsted has, at least, postponed that evil day to the very distant future.

Orchard Notes.

AUGUST.

C. G. SAVAGE and H. BROADFOOT.

Ploughing.

IT is most important that ploughing should be completed without delay. The beneficial effects of early ploughing can scarcely be over-estimated, and are generally recognised by all thoughtful and observant orchardists. Briefly stated, the benefits derived from early ploughing are to put the soil into such a mechanical condition that it readily absorbs winter rains, to expose the soil to the beneficial effects of frost action, and to help to decompose effectively any organic matter that has been ploughed in. There is always the possibility of a dry spring, and many a grower who has delayed his winter ploughing has reasons to regret his remissness.

Planting.

Although the early planting of deciduous trees is highly desirable, for a tree planted early is establishing a root system long before signs of growth above ground appear, and is thus developing in such a manner as will give it a good start when the mild days of spring are ushered in, it is not yet too late to plant such trees. Where late frosts are not known citrus trees may be planted, but the planting of citrus trees had better be deferred in localities in which there is a likelihood of late frosts.

Grafting.

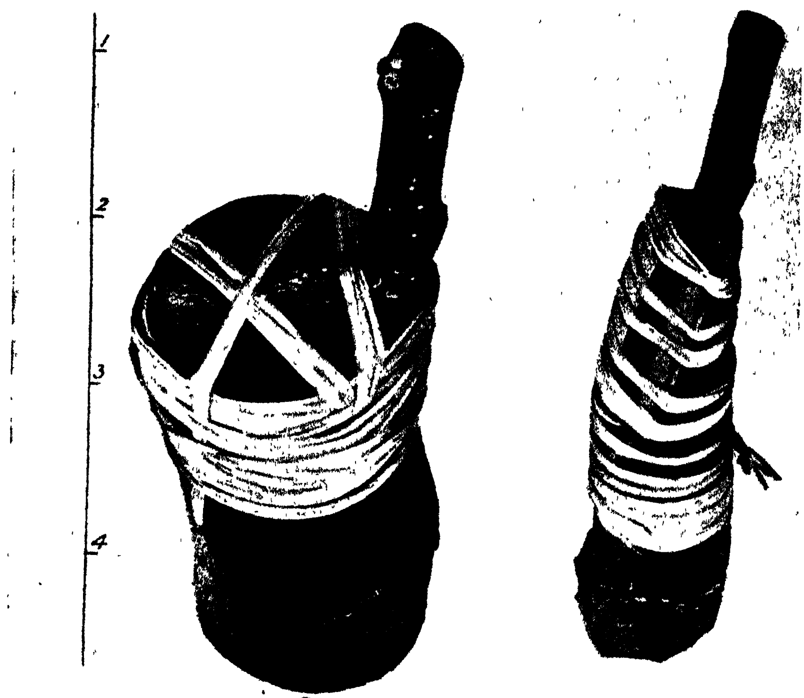
During the second half of August grafting may be carried out. If the grower has any unprofitable trees he should graft better varieties on to them, but he should take every care in selecting wood for grafting, and he should use scions only from such trees as have proved their fruitfulness and the quality of their fruit. If such care is not taken, the state of the tree after grafting is likely to be worse than in the first instance.

Bark-grafts.
The ties should come up much higher than shown in this illustration

Grafting, as a method of working many varieties of trees, is used in preference to budding, and old trees are often top-grafted in preference to being budded, as, by inserting grafts in the branches close to the trunk, many of them will grow if properly put in; and should any fail, a young

shoot may be allowed to grow, and later on a bud inserted. Top-grafting is generally more successful with apples and pears than with stone fruits.

There are several methods of grafting practised, but the whip-graft finds most favour with growers of small stocks. Cleft-grafting is used at times for working over old fruit trees, particularly pears, apples, plums, and so on. Strap-grafting, which is another method of bark-grafting, may be used for working over medium to large-sized old trees, and for this method splitting the limbs is not required, but the scion is thrust down between the bark and the wood, and a strip of bark, supported by a thin strip of sap wood, is carried across the top of the wood to be grafted, and inserted under the bark on the further side, as shown in the illustration.



Strap-grafting.
Scions tied and ready for either waxing or claying.

Grafting Wax.

The following is a good recipe for preparing grafting wax, the chief object of which is to exclude the air from the cuts on both stock and scion, and in this way to prevent the scion or the wood of the stock with which it comes in contact from drying before the union is effected. The wax should not be made so hard that it will crack after being applied. The following ingredients should be found satisfactory:—4 lb. resin, 2 lb. beeswax, 1 lb. mutton tallow. Dissolve over a slow fire, and apply with a small brush

while warm. If it is found necessary to apply this with the hands, it is best to keep them well greased, so as to prevent the wax from sticking to them. Another formula is:—1 lb. beeswax, 5 lb. resin, and 1¼ lb. boiled linseed oil.

Farmers' Bulletin No. 63 deals with budding and grafting fruit trees. This bulletin can be obtained either from the Department of Agriculture, or from the Government Printer, Phillip-street, Sydney. The price is 9d., plus 1d. postage.

Insect Pests.

It is not too late to spray trees that have not yet commenced to shoot if they are infested with San Jose scale. Strict watch should be kept for this pest. The most efficacious check can be kept on San Jose scale by spraying with miscible oil.

Spraying oil should be applied to cherry and peach trees that are aphis-infested, and the application should be made as late as possible before the buds burst in the spring. The spraying will be useless unless it is done thoroughly, and it is essential that it be applied with sufficient force to break up the clusters of aphides. An application of nicotine extract after the trees have commenced to shoot may be necessary. Great damage may be done by this destructive pest if measures are not taken to keep it in check, as its ravages not infrequently extend beyond the current year's crop and prejudicially affect the crop of the year following.

Apples placed in common storage require careful supervision, as black spot and common moulds sometimes make their appearance. The fruit grower finds that the price of success in controlling pests is unfailing vigilance.

Fungous Diseases.

In many of the apple-growing districts, powdery mildew appears to be on the increase. Some of the varieties most affected by it are Jonathan, Rome Beauty, and Sturmer. It cannot safely be ignored, and the best treatment to keep this fungus in check is to remove all infected twigs and later to spray with colloidal (atomised or atomic) sulphur.

Fertilising Citrus Trees.

In most districts oranges and mandarins are carrying, or have carried, a good crop of fruit, which, on the whole, is heavier than the average season's crop. Prices for the fruit have been influenced by the quantity produced as well as by the cheap rates at which apples have been obtainable. It is certain that next year's crop of apples must be relatively light, though prices will be higher, and these same conditions are likely to be experienced with citrus production.

Fertilising citrus trees is, therefore, recommended as being a more profitable operation than usual during the forthcoming season. Fertilisers, particularly those having a high nitrogen content, are advised. The complete fertilisers usually sold for use on citrus trees do not contain sufficient nitrogen for the majority of trees. If such fertiliser mixtures are

used it is recommended that additional sulphate of ammonia or nitrate of soda be applied, in quantities varying from 3 to 10 lb per tree, for trees in bearing and from five to twenty years old.

Be Your Own Experimenter.

Every grower is advised to experiment on a few rows of trees with nitrogen, phosphoric acid, or potash only. In treating the remaining trees a good mixture may be used, which can be made of the following:—6 cwt. sulphate ammonia, 3 cwt. superphosphate, 1½ cwt. sulphate of potash. Mix all together well, and apply 1 lb. of the mixture per tree for each year of the tree's age. Thus a seven-year-old tree will receive 7 lb. Apply about half of this amount by the time the buds burst, a further quarter of the amount about the end of October, and the remaining quarter by January. In districts where rainfall is not likely to be excessive, and danger of leaching is therefore small, a larger amount may be applied at the first application.

Any experiments conducted by the grower should be for a period of at least three years, by which time a reduction of phosphoric acid or potash may be found possible.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.	Society and Secretary.		Date.
Condobolin (J. M. Cooney)	Aug.	14, 15	Barmedman (S. S. Pembethy)	Sept.	12
Gilgandra (G. Christie)	,,	14, 15	Canowindra (W. E. Frost)	,,	18, 19
Illabo (R. Day)	,,	15	Murrumburrah (W. Worner)	,,	18, 19
Cargellico	,,	21, 22	Temora (A. D. Ness)	,,	18, 19, 20
Wagga Wagga (F. H. Croaker)	,,	21, 22, 23	Boorowa (W. Thompson)	,,	20, 21
Bogan Gate (J. Egan)	,,	22	Melbourne Royal	,,	20 to 29
Ungarie	,,	28	Barellan	,,	26
Grenfell	,,	28, 29	Singleton	,,	26 to 28
Parkes (L. S. Seaborn)	,,	28, 29	Hillston (S. Peevers)	,,	28
Junee (G. W. Scrivener)	,,	28, 29	Ardlethan	Oct.	3
Forbes (K. O. Anderson)	Sept.	4, 5	Quandialla (V. Talbot)	,,	3
Corowa (H. G. Norton)	,,	4, 5	Walbundrie (H. G. Collins)	,,	3
West Wyalong (A. Andrew)	,,	4, 5	Narrandera (J. D. Newth	,,	9, 10
Young (T. A. Tester)	,,	5, 6	Ariah Park (Mort Collings)	,,	10
Holbrook	Sept.	6, 7	Bribaree (Jesse Austin)	,,	10
Cowra (E. P. Todhunter)	,,	11, 12	Griffith (W. Sellin)	,,	16, 17
Ganmain (C. C. Henderson)	,,	11, 12	Deniliquin (P. Fagan)	,,	16, 17
Manildra	,,	11, 12	Cootamundra (R. D. Beaver)	,,	23, 24
Albury	,,	11, 12, 13			

The Pig as a Rent Payer.

The pig is well known as the farmer's best scavenger, the housewife's most wholesome sink, but he excels as a rent payer, for he provides the dairyman with a return for his skim milk, the butcher a return for his offal, and the farmer a return for his surplus roots, grain, and greenstuff; and the profits are even greater when these feeds are combined, for skim milk contains too large a proportion of water, butchers' offal an excess of protein, and grain (with the exception of peas and beans) an overplus of carbohydrates.—E. J. Shelton, in the *Queensland Agricultural Journal*.

CONTENTS.

In Memoriam.

Mr. W. H. BROWN,

Died 10th August, 1928, aged 55 years.

THE Minister of Agriculture, the Hon. H. V. C. Thorby, M.L.A., the Under-Secretary, and officers of the Department of Agriculture, including the staff of the *Agricultural Gazette,* deeply regret the death of Mr. W. H. Brown, and desire to record their appreciation of his valuable services to the Department during the years he was connected with its official journal.

Mr. Brown was appointed to the Department in 1912 as Editor of the *Agricultural and Pastoral Notes,* and the success of that news-sheet as a means of keeping country newspapers in touch with Departmental recommendations and methods was entirely due to his efforts. In 1914 he was appointed as Assistant Editor of Publications, and five years later was promoted to the position of Editor, which he occupied until the time of his death.

His extensive experience in journalistic work on the agricultural columns of newspapers, both in this State and in New Zealand, enabled him to accumulate a vast store of knowledge on matters agricultural, and this coupled with the fact that he was widely read, and possessed of great capacity, resulted in the standard of the numerous Departmental publications being raised to a high level, which has been greatly appreciated by the farming community throughout the whole State.

Apart altogether from his work, Mr. Brown's kindly and courteous nature endeared him to all with whom he came in contact, and he will always be affectionately remembered by his fellow officers.

Grasshoppers.

DEPARTMENTAL RECOMMENDATIONS FOR CONTROL.

W. B. GURNEY, B.Sc., F.E.S., Government Entomologist.

THE damage caused to pastures and wheat crops in different parts of the State last autumn calls attention to a possible recurrence of the pest in the spring and, consequently, to the necessity for growers to be on the lookout in case the conditions experienced during the winter have been favourable to the hatching of the eggs in the spring.

Apart from their normal habit of laying eggs on bare patches in the pastures, it is known that in some cases the grasshoppers also lay their eggs in crops, and should any of these hatch prior to harvesting, the proper methods of control should be employed to destroy them while they are in the "hopper" stage and before they are capable of doing any damage to the crop. The same may be said in regard to eggs laid in pasture, for it is only by early observation of the hatching of hoppers from the egg-beds, and the adoption of control measures immediately that the pest can be satisfactorily controlled. Farmers and pastoralists, therefore, are reminded to be on the watch and to take immediate steps to use the poisoned bran or spray method of control recommended for crops or pasture as the case may be.

The grasshopper which appears at intervals in destructive swarms throughout various districts of the State is a small brown species about 1½ inches long, known as *Chortoicetes terminifera.* This species occurs also in swarms in Queensland, Victoria, South Australia and Western Australia, and is therefore widespread. Occasionally another species, *C. pusilla,* has appeared in swarms, and in the Hunter River Valley *Oedaleus senegalensis* also appeared one season in large swarms. In Queensland a coastal species, *Cyrtacanthacris exacta,* found also in eastern New South Wales, appears occasionally in swarms, and does some harm to the sugar-cane fields. However, we may confine our attention to the small brown species (*C. terminifera*) first mentioned above, which is the only one of serious import in this State.

Occurrence of the Swarms.

Fortunately this species only appears at intervals approximating five years, though, of course, it is present every year in limited numbers. Dry conditions apparently favour the development of grasshoppers, and following several dry seasons the grasshoppers may increase sufficiently to appear in swarms; conversely, wet seasons seem adverse to the increase of grasshoppers. Any decrease in native insectivorous birds would aid the natural increase of the hopper, birds being persistent factors in reducing the swarms, especially in the hopper stages. Ibis, wood-swallows, starlings,

bustards, and even magpies and crows feed on the swarms of hoppers. The influence of internal and external parasites, and predators of eggs and of the grasshoppers themselves, is often overlooked as a factor in control. Several species of parasitic flies, chiefly *Locustivora pachytyli*, have frequently been recorded in the maggot stage parasitising grasshoppers and causing appreciable mortality. Species of Scelio (small black wasps) have also been recorded searching in the soil and parasitising and thus destroying a percentage of grasshopper eggs.

The factors essential to the decrease of grasshopper swarms, therefore, are wet seasons, the prevalence of insectivorous birds, and various small wasp parasites of eggs, certain predatory beetles and mites, and several species of parasitic flies which live within the bodies of the grasshoppers. The above factors are sufficient to account for the rise and fall in the number of grasshoppers, and the appearance of swarms for a season or two, followed by their almost sudden reduction to a few scattered individuals during even longer periods.

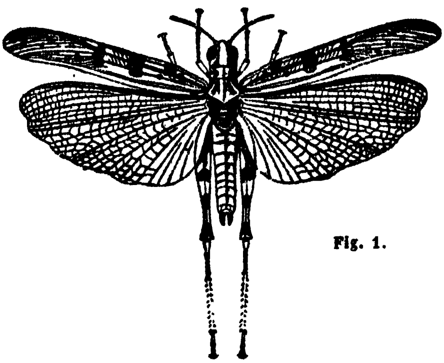


Fig. 1.

Fig. 2.

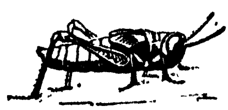


Fig. 3.

Fig. 1.—Plague Locust (*Chortoicetes terminifera*).
Fig. 2.—Youngest stage of "hopper," when spraying is most effective.
Fig. 3.—Late stage of "hopper," with wing pads well developed.

Number of Broods.

Two main broods are noticeable throughout the year. The over-wintering eggs in the ground hatch during late August and through September and October. These young hoppers grow gradually and become winged (according to the date they hatch) from late November through till January. The eggs of these winged forms produce the second brood of hoppers, which may be in evidence throughout December until March. By April and May the second brood of winged hoppers has appeared, and these lay their eggs in the soil, where they over-winter until about the following September. It will be seen that although there are two main broods, the dates of their appearance are irregular owing to different dates of hatching, and also to the fact that the adult winged grasshoppers lay several batches of eggs, with the result that both hopper and winged stages may overlap even in the same district.

The Habits of the Grasshopper.

Both hoppers and winged forms feed wholly on grass, weeds, crops, and other vegetation. The winged forms fortunately possess the habit of congregating and settling on comparatively limited areas for the purpose of laying their eggs. The swarm generally selects somewhat bare scalded patches on gently rising land when congregating for this purpose. These egg-beds may, therefore, be patches of land of a few hundred square yards up to many acres in extent. The winged swarms may fly for miles, and there is a tendency for swarms to avoid timbered land when settling to feed. The young hoppers on hatching spread outwards from the egg-beds, feeding on the grass and moving forward in long lines of thousands of

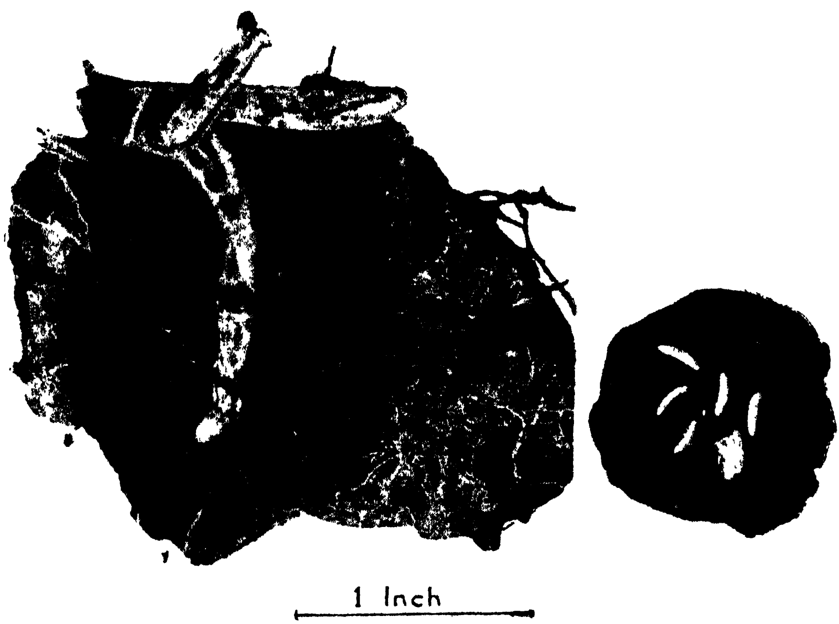


Fig. 4.—Left: Transverse section of Female Hopper Ovipositing.
This female, being "caught in the act," was promptly killed, and the soil carefully opened to disclose the extended ovipositor.

Right: Eggs of Grasshopper in the Soil.

tiny wingless hoppers. These increase in size, and by a series of moults gradually attain to the adult winged stage. The male and female forms copulate, and when the female is ready to lay her eggs she settles on the ground and inserts the hind part of her body in the soil by working two pairs of short hard ovipositor blades at the extremity of the abdomen. Even the hard soil of scalded patches, roadways, and beaten tracks may be penetrated and the eggs deposited at depths of from 1 inch to 3½ inches. The abdomen of the female is abnormally extended to enable it to deposit the eggs so deep in the soil. A frothy liquid secretion is exuded along with

the eggs, which hardens into an irregular sheath of a tough spongy nature, and considerably protects the eggs from predaceous insects and from the effects of moisture.

An average of thirty-six eggs is laid by the female in each hole, and each female may lay more than one cluster of eggs. A very great number of egg holes are constructed side by side in the soil when the swarms cluster together for egg-laying. The number of egg-holes per square foot varies considerably; counts made where swarms were dense have revealed from 200 to 800 holes, with an average of about 300 per square foot over several acres. At a conservative estimate, therefore, there were 10,000 eggs per square foot in these areas, or over 400 million eggs per acre. This emphasises the great advantage of locating these egg-beds, and of destroying the young hoppers immediately they hatch and before they spread.

Fig. 5.—Swarm of Female Winged Hoppers, settled for Egg-laying.

Life History.

Briefly recapitulated, the life stages may be presented thus:—

Over-wintering egg stage—Five months, hatching about September.
First hopper swarms—September to November.
First winged swarms—December to February.
Midsummer egg-laying—December to February.
Second hopper swarms—January to March.
Second winged swarms—March to May.
Autumn egg-laying—March to May.

Due allowance must be made for variations in climatic and local conditions.

Control Methods.

On Grass Lands.—The best control is to be obtained by either baiting or spraying the swarms of young hoppers during the first three or four weeks after they hatch from the ground and before they have spread far and

scattered, which they do as they grow older, and especially when they are allowed to reach the winged (flying) stage. Baiting with poisoned bran is cheaper than spraying, obviating the need for the purchase of spray pumps and involving less labour in application. Primarily designed for use in cultivation paddocks, it may be employed on pasture land also if the bait is scattered in fine flakes, and as an additional precaution stock are kept off for several days. The bait recommended and the method of use are given on page 650. The cost per acre for material is between 2s. and 3s.

An important factor in the scheme of control is to mark the egg-beds, which, as stated, are limited patches from a few hundred square yards up to 50 or more acres, according to the size of the swarms. Having marked the egg-beds, or noted in the spring where the young hoppers are hatching, organised working parties should treat the patches within three or four weeks after emergence. The effect is to kill the young hoppers before they have done any appreciable damage. If this was universally carried out, the pest could be controlled in the spring before a second and larger swarm of hoppers could be produced in the midsummer. Labour, time and material can all be saved by spraying or baiting early in the spring, as the subsequent swarms will then be almost negligible.

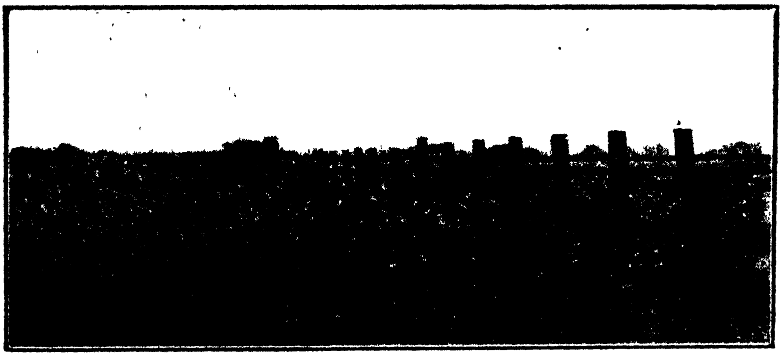


Fig. 6.—Swarm of Winged Hoppers disturbed.

The complete efficacy of arsenite of soda spray as a control for grasshoppers in the hopper stages on pasture land has now been demonstrated over a number of years. The spray formula recommended is 1 lb. arsenite of soda, 4 lb. of treacle or molasses (preferably molasses), and 16 gallons of water. Even without treacle or molasses, this spray is valuable for control.

Dissolve the arsenite of soda in some hot water in one vessel, and the molasses also in warm water in another vessel. Allow the two solutions to almost cool before mixing them together and diluting to the correct strength.

The spray should first be applied on a strip of grass about 30 to 50 feet wide immediately in front of the advancing hopper swarms, and then directly on to the swarms. The spray kills partly by caustic action, but

mainly because the hoppers drink the liquid or feed on the poisoned grass. Spraying need only be light. About 75 to 80 gallons of spray per acre is quite sufficient—it is not necessary to waste material by drenching the grass, but merely to apply it in a fine mist. The cost for ingredients works out at about 4s. 6d. per acre. It has been proved by severe tests that the spray, made and applied as directed, is not harmful to sheep.

Experiments have been carried out at Narromine with calcium cyanide dust for the control of grasshoppers. It was found that where the dust was applied directly on to a swarm of hoppers, so that it dusted their bodies, it resulted in a very satisfactory kill. It was necessary, however, actually to hit the hoppers with the dust, and it did not kill them when they were driven over dust which had been applied to grass or ground. There was evidence on the other hand that a strip of ground dusted with calcium cyanide deflected hopper swarms, and it might therefore be used to turn swarms away from cultivation paddocks. It was found that at least 5 lb. of pure calcium cyanide dust must be applied per square chain to kill the hoppers with direct application. This means 50 lb. of calcium cyanide is needed per acre, which works out at over £3 per acre. It is considered too expensive, therefore, for large-scale operations. Where water is extremely scarce and has to be conveyed long distances, however, or where a quick kill of advancing hoppers is needed to protect cultivation paddocks or orchards, calcium cyanide could be used.

Calcium cyanide, diluted half and half with an inert substance (talc powder), was also tested, but was found at this dilution to kill not more than 50 per cent. when applied directly on to the young hoppers. A knapsack duster was employed in all these experiments.

In cultivation paddocks the poisoned bran bait previously referred to is recommended. This bait is broadcast (from carts or from sacks carried across the shoulders or on horseback) in or on the edge of the crop as may be necessary over a strip 30 to 50 feet wide in front of the advancing swarm at the rate of about 20 lb. per acre, according to the extent of the invasion. Experiments carried out at Leadville and Coolah Valley showed that bran and paris green gave excellent results, but it was found that white arsenic with soda to form arsenite of soda gave a quicker kill. White arsenic alone was less effective than paris green. The following formula, therefore, can be recommended:—

1 lb. paris green, or ½ lb. arsenite of soda ;
4 lb molasses, or treacle ;
24 lb. bran.

With a shovel, mix very thoroughly the arsenite of soda or the paris green and bran while dry, and combine with the mixture the molasses dissolved in sufficient water to make the whole into a wet crumbly mash, capable of being scattered in fine flakes. It will be necessary to powder the arsenite of soda before mixing with the bran. This is difficult, and to obviate the necessity for doing so, ¾ lb. white arsenic could be used instead

of the arsenite of soda. As already stated, use may be made of this bait on grass land also, where massed hoppers are advancing, if care is taken to scatter it in a finely divided state (not in pellets of heaps) and stock are kept temporarily away. Stock must not be permitted where these baits are employed until several days have elapsed, after which the bran will have become dry and unattractive.

Hoppers are poisoned by this bait within twenty to forty hours.

In America sawdust or horse manure has been employed in place of the bran, and has been found fairly attractive, and cheaper. Experiments abroad have also shown that the addition of chopped-up oranges, at the rate of about five to each 24 lb. of bait, makes it more attractive.

Need for Co-operation.

The efficacy of arsenite of soda spray and of poison bran mash having been demonstrated, it is obvious that all that is required is timely action throughout each district.

The problem is a community one, and should be taken up as such. The best results can only be obtained when every landowner is on the lookout and is prepared to aid in combating the pest. Preparations should be made before the first spring hatching of the hoppers. A sufficient supply of material should be purchased and stocked in each district. All agricultural and pastoral organisations, such as Pastures Protection Boards, Graziers' Associations, Farmers and Settlers' Associations, Pastures Protection Unions, and the Agricultural Bureau, should take combined action in "hopper" liable districts. This could be done by the formation of small district committees, which could collect the necessary funds, and secure the supply of spray pumps and materials and labour, so that a decisive attack may be made with the earliest appearance of the young "hoppers." A plan of action along these lines would provide for the storage of spray materials at depots, say, 50 to 100 miles apart, providing for rapid transit, and, if possible, further supplies should be available at headquarters, say, Sydney, to be drawn on if required. Local representative committees should be formed, consisting of about ten members and a secretary, to control areas from 25 to 50 square miles, to secure reliable data as to where winged forms were noticed to be laying eggs during the last autumn, and to arrange for prompt advice as to where hatching takes place in the spring. Efficient organisation in this way would secure effective control of the pest.

It is incumbent that all districts where grasshopper swarms occur should be prepared, and should undertake this co-operative work, so that adjacent districts carrying out control work shall not be re-infested by flying swarms from districts that have neglected to adopt control methods. The expense is limited to treatment of the initial swarms, and the outlay is only likely to occur in any district once in five years or more. With control measures universally adopted the grasshoppers should not be able to appear in

destructive numbers in any part of the State. A nominal levy once in five years or so of a fraction of one penny per acre or based upon the stock held would provide all the funds necessary.

All such grasshopper control committees should insist on landowners giving notice of the presence of egg-beds or winged swarms, and also of the first appearance of any batches of young hoppers hatching from the ground. This will enable prompt action in treatment and the destruction of the swarms before they can assume dangerous proportions.

Cowper Sorghum.

THE variety of saccharine sorghum that has been grown under the name of Selection No. 61 will in future be known as Cowper.—J. N. WHITTET, Agrostologist.

Pruning Competitions.

WITH the object in view of lifting the pruning of both trees and vines on to a higher scale throughout the State, the Department of Agriculture has decided to inaugurate a series of pruning competitions under the auspices of the Agricultural Bureau, and Mr. C. G. Savage, Director of Fruit Culture, outlined the scheme at the recent annual State Conference of the Agricultural Bureau.

The competitions will be conducted in various fruit-growing centres, the competitors pruning the commercial types of trees or vines growing in the respective centres. Points will be allotted in the various classes, the maximum number for each class being divided into several sections, such as selection and treatment of fruiting wood, selection of leaders and shaping of the trees, also for clean work, and so on.

It is proposed to offer certificates for competency in every class to competitors who gain 80 per cent. of the possible points awarded. This percentage may sound high, but the certificate to be of value must be worth winning and act as a testimonial for the holder. At the present time there are many men posing as fruit tree pruners who should not be allowed to touch a tree. If the Department can, by means of these competitions, train men to prune in the proper manner, much will be done towards raising the standard of our fruit crops.

The various district competitions, which it is proposed to conduct, will be carried out by local committees, who will arrange details in connection with the competitions in their respective districts, and the Department of Agriculture will appoint officers of the Fruit Branch to act as judges. When the district competitions are satisfactorily organised it is proposed that certain districts co-operate to inaugurate championship competitions. In these championship contests, the winners in various sections of the district competitions will be eligible to compete.

Details of the scheme are being worked out, and a basis for the competitions is being prepared, which will be submitted to the various branches of the Agricultural Bureau and other growers' organisations in the near future for their consideration.

Maize Varieties.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

THE following are the varieties of maize recommended for different purposes in the various districts :—

APPROXIMATE ORDER OF MATURITY OF VARIETIES RECOMMENDED.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Gold Coin, Golden Superb, Kennedy, Iowa Silvermine, Funk's Yellow Dent, Iowa Goldmine, Auburn Vale, Craig Mitchell, Goldmine Crossbred.

Midseason.—Hickory King, Leaming, Coodra Vale, Golden Nugget, Early Clarence, Golden Beauty.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Yellow Moruya, Ulmarra Whitecap, Bega Yellow.

VARIETIES RECOMMENDED FOR GRAIN.

UPPER NORTH COAST.

(*a*) *Tweed River.*

Early Crop.—Leaming, Craig Mitchell, Iowa Silvermine.
Main Crop.—Fitzroy, Ulmarra Whitecap, Large Red Hogan (for early sowing only).

(*b*) *Lower Richmond River.*

Early Crop.—Hickory King (second-class soils only), Leaming.
Main Crop.—Golden Nugget (second-class soils only), Fitzroy.

(*c*) *Upper Richmond River.*

Early Crop.—Leaming.
Main Crop.—Fitzroy, Large Red Hogan, Ulmarra Whitecap.

(*d*) *Clarence River.*

Early Crop.—Leaming.
Main Crop.—Fitzroy, Ulmarra Whitecap.
Second-class Soils.—Golden Nugget, Hickory King.

(*e*) *Bellinger River.*

Early Crop.—Leaming, Iowa Silvermine.
Main Crop.—Fitzroy, Ulmarra Whitecap.

NORTH COAST TABLELAND.

Dorrigo and Comboyne Districts.

Main Crop.—Leaming, Golden Superb, Golden Nugget.

MIDDLE NORTH COAST.

(*a*) *Nambucca River.*

Early Crop —Golden Superb, Leaming.
Main Crop.—Fitzroy, Yellow Hogan.

(*b*) *Lower Macleay River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.
Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Golden Beauty, Pride of Hawkesbury.

(*c*) *Upper Macleay River.*

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan.

(*d*) *Hastings River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.

Main Crop.—Fitzroy, Large Red Hogan, Golden Beauty.

(*e*) *Lower Manning River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.

Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Pride of Hawkesbury.

(*f*) *Upper Manning River.*

Early Crop.—Golden Superb, Funk's Yellow Dent, Iowa Silvermine. Craig Mitchell.

Main Crop.—Fitzroy, Leaming, Golden Beauty, Yellow Hogan.

CENTRAL COAST.

(*a*) *Lower Hunter River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell, Golden Superb.

Main Crop.—Large Red Hogan, Fitzroy.

(*b*) *Hawkesbury River.*

Early Crop.—Golden Superb.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming.

(*c*) *County Cumberland.*

Early Crop.— Hickory King.

Main Crop.—Fitzroy.

SOUTH COAST.

(*a*) *Illawarra District.*

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine, Craig Mitchell.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan.

(*b*) *Shoalhaven River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.

Main Crop.—Leaming, Funk's Yellow Dent, Fitzroy, Boone County White.

(c) Milton District.

Early Crop.—Funk's Yellow Dent, Craig Mitchell, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Fitzroy, Large Red Hogan, Leaming.

(d) Moruya River.

Early Crop.—Funk's Yellow Dent, Craig Mitchell.

Main Crop.—Large Red Hogan, Yellow Moruya.

(e) Bega River.

Early Crop.—Funk's Yellow Dent, Craig Mitchell, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Yellow Moruya, Golden Beauty, Bega Yellow, Yellow Hogan.

NORTHERN TABLELAND.

(a) Tenterfield District.

Wellingrove, Funk's Yellow Dent, Golden Glow, Iowa Silvermine.

(b) Glen Innes District.

Strong Soils.—Wellingrove, Iowa Goldmine, Goldmine Crossbred.

Light Soils.—Wellingrove, Iowa Silvermine.

(c) Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.

Early Morn, Golden Glow.

(d) Armidale District.

Funk's Yellow Dent, Wellingrove, Golden Glow, Gold Coin, Golden Superb.

(e) Uralla District.

Wellingrove.

CENTRAL TABLELAND.

(a) Bathurst District.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

(b) Colder Districts.

Early Morn.

SOUTHERN TABLELAND.

Moss Vale District

Golden Glow.

NORTH-WESTERN SLOPES.

(a) Inverell District.

Heavy Soils—Funk's Yellow Dent, Kennedy, Auburn Vale, Funk's 90-Day.

Light Soils.—Wellingrove, Iowa Silvermine.

Late Sowing.—Early Morn, Golden Glow.

(b) Tamworth and Upper Hunter Districts.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

CENTRAL-WESTERN SLOPES.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine, Early Morn.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut River.*

Rich Alluvial Flats.—*Main Crop* (October sowing), Early Clarence; *Early Maize* (late sowing), Funk's Yellow Dent, Craig Mitchell.

Second-class Alluvials —Funk's Yellow Dent, Iowa Silvermine.

(*b*) *Murrumbidgee River* (*Gundagai District*).

Funk's Yellow Dent, Coodra Vale, Iowa Silvermine, Golden Glow.

MURRUMBIDGEE IRRIGATION AREAS

Funk's Yellow Dent, Iowa Silvermine.

VARIETIES RECOMMENDED FOR GREEN FODDER.

COASTAL DISTRICTS.

Early Varieties. Hickory King, Leaming, Craig Mitchell.

Late Varieties.—Fitzroy, Pride of Hawkesbury, Ulmarra Whitecap, Whitecap Horsetooth.

TABLELAND DISTRICTS.

For Warmer Districts.—Fitzroy.

For Cooler Districts.—Hickory King, Leaming.

For Coldest Districts.—Wellingrove.

WESTERN SLOPES AND MURRUMBIDGEE IRRIGATION AREAS.

Fitzroy.

Where Pure Seed may be Obtained.

The Department publishes in the *Agricultural Gazette* (see page 710 of this issue) a list showing where pure seed maize of the different varieties recommended to farmers may be obtained. These supplies come either from the experiment farms or from reliable farmers in different districts who are concentrating on the selection and improvement of one variety, which is thus kept pure and maintained or improved in yielding capacity. A source of approved and tested seed is thus indicated to farmers. The varietal recommendations of the Department for different districts, as given in the foregoing pages, are the result of many years' trials on farmers' experiment plots in such districts.

The Department is willing to send out free samples of pure seed of varieties of maize for trial to any *bona fide* farmer in the State on application.

Cultural Notes on Maize.

From R.A.S. Field Maize Championships, 1928.

L. S. HARRISON, Special Agricultural Instructor.*

THE results of the Royal Agricultural Society Field Maize Championships were published in the *Agricultural Gazette* for July last, but close consideration of the following details of cultural methods as practised by competitors will repay the reader.

The Northern Championship.

Mr. F. Cornish's winning crop at Glen Innes was grown on land ploughed 4 inches deep in August, then double-row checked in, in the middle of October, four grains every 3 feet 8 inches. It was double and single-row scuffled four times and kept clean by hand hoeing.

The crop placed second—that of Mr. B. J. Bell, of Armidale—followed lucerne, and was sown on land ploughed 8 inches deep in August and harrowed, then planted with single dropper the first week in October in rows 3½ feet apart, and one and two grains dropped every 15 inches. It was later harrowed and double-row scuffled three times, single-row cultivated twice, and hand hoed.

The Tenterfield crop on the Cooredulla Estate was planted on land ploughed the end of July; cultivated September; harrowed twice in October; single-row dropped in at end of October in rows 3 feet 9 inches apart, and single grains about 15 inches apart; later harrowed and scuffled twice.

The Inverell crop of Wellingrove, submitted by Mr. R. Morell, was grown on land ploughed the end of November, twice harrowed, and planted in early December with a single dropper—3½ feet between rows and two and three grains every 2 feet. It was cultivated twice after the crop was up. Definite relationship of the winning district crops with the best practices in cultivation are here somewhat obscure, and it is essential that close attention be paid to soil variation in determining the necessity of different operations. Whilst the Tenterfield crop was the earliest ploughed amongst the four under review, it received the lowest number of points for "cultivation," owing to the presence of couch grass, and as with Armidale, being highest for "cultivation," the previous history will partly indicate the reason for its almost perfect condition. After-cultivations are necessary for weed control and the conservation of moisture, and should be continued as required until the crop reaches the tasselling stage.

* Mr. Harrison acted as judge in the four district championships.

Tumut and Gundagai Championship.

The preparation of Messrs. Butler Bros.' land at Tumut commenced with a 6-inch ploughing at the end of September; then rolled and harrowed; ploughed again in October, and harrowed and rolled; planted the end of October with a double-row dropper—rows 3½ feet apart, two and three grains every 2½ feet in the row. Later the land was scarified twice.

Mr. H. Scheuner, of Gundagai, on Tumut River flats, ploughed 6 inches deep in August; re-ploughed in October; planted late in November with double dropper in rows 3¾ feet apart and three and four grains every 3 feet; cultivated later with springtooth; and disc cultivated and hand hoed. Both competitors indicated a sound knowledge of the requirements of their respective soils and this was reflected in the results. These two entries were on Tumut alluvial soils, and, whereas conditions for such were mostly satisfactory, the entire absence of winter rains on the Murrumbidgee areas of the Gundagai district were responsible for the failure of crops this year. Thus, when a dependence is made on the winter fall, it is quite necessary to plough in autumn or early winter, so that all the moisture possible may be conserved and retained against a later usually dry condition. However under ordinary conditions particularly good crops may be grown, assisted by the winter conservation of moisture. The similar requirement of early ploughing, retaining soil condition until planting, and subsequent cultivations as dictated are just as urgent throughout the whole of the Tumut and Gundagai districts as elsewhere.

The South Coast Championship.

The winning crop of Mr. D'Arcy, of Bega, was prepared for by ploughing at the end of August; then harrowed, rolled, cultivated, harrowed and rolled, and planted middle of October, with a double dropper—3½ feet between rows, and two and three grains every 2 feet. The crop was harrowed twice, cultivated twice, hand hoed twice, and cultivated twice, alternately.

Mr. Caffery, of Nowra, ploughed in early September 8 inches deep; rolled and disced four times; then harrowed and rolled before planting in the middle of October; hoed-in 2½ feet each way. Later two scufflings were given and a hand hoeing.

The Kangaroo Valley entry submitted by Mr. Parish was ploughed in August, 7 inches, and harrowed twice; planted on 1st October with hoe—3½ feet between rows and one grain every 10 inches. It was then scuffled twice and hand hoed.

Mr. H. Ball, Moruya, ploughed 3½ inches on 1st August; then disc harrowed eight times (this plot was previously a grass paddock); cross disced; harrowed four times, and later harrowed six times; planted early September with single-row dropper—rows 4 feet apart and two grains every 15 inches. The crop was scuffled twice, hand hoed, and hilled. The variety was Large

Red Hogan, and this with Funk's Yellow Dent and Yellow Moruya can be recommended for the district.

Mr. J. A. Martin, Pambula, ploughed 7 inches deep early in July, and harrowed four times; planted in early October in single rows 3½ feet apart and 10 inches between grains. The crop was harrowed and scuffled several times, and fertilised with 2 cwt. of superphosphate to the acre. The variety was Funk's Yellow Dent, which, with Yellow Hogan, Bega Yellow, and Golden Beauty can be regarded as good varieties for the locality.

Mr. J. Bennett, of Albion Park, was the local winner, but had harvested his crop prior to inspection, leaving the second crop, that of Mr. J. T. McInerney, to represent Albion Park.

Mr. J. Bruchhauser, of Camden, the winner in that locality, had also harvested his crop before it could be judged. It is very much regretted that both Mr. Bennett and Mr. Bruchhauser were prohibited from competing for the cups, and it is to be hoped that in some future year they may again be winners in the local competitions, so that they will be enabled to compete for the higher honours. Cultivations throughout, for the most part, were thoughtfully given and a consideration of the particulars will be of interest. The highest yield was secured by Mr. Caffery's Hickory King, a really remarkable result. It will be noticed that 2 cwt. of fertiliser was applied and this together with the close planting (rather too close for safety) contributed to the yield.

The North Coast Championship.

Mr. Davis, of Taree, ploughed in April, the paddock having been under lucerne from 1910 to 1926; ploughed again at end of July; harrowed and rolled in August, and cultivated in October. Superphosphate (1¾ cwt.) was ploughed in shallow at the end of September, and the crop was planted by hand on 12th October, with 1 cwt. of superphosphate—rows 4 feet apart, and four grains every 2 feet. Later on it was scarified twice and tilled in December, and top-dressed with 1 cwt. of nitrate of soda.

The Bellingen block of Mr. R. S. McDougall was ploughed 9 inches in September, and harrowed prior to planting early in November with single dropper—4 feet between the rows and two grains every 20 inches. Later on it was scuffled twice and hilled. Varieties suitable for the Bellinger, in addition to Fitzroy, are Leaming and Ulmarra Whitecap.

Mr. Ducat, of Temagog, ploughed 8 inches deep in August, and then harrowed and rolled; ploughed, rolled and harrowed, and planted at end of October with a single dropper—4 feet between rows, and two and three grains every 32 inches. It was later harrowed, cultivated, and hilled. Together with Fitzroy, Yellow Hogan, Pride of Hawkesbury, Large Red Hogan, Golden Beauty, and Golden Superb, are recommended for the Macleay.

The particularly thorough preparation given by Mr. Davis, and the heavy dressings of fertiliser again, as with the Nowra crops, contributed much towards his well-earned win, and the generalisation previously made regarding the interrelationship between soil requirements and cultural method is well illustrated.

To enable available plant food and moisture to be retained, cultivation is necessary for the control of weeds and grasses, and the preparation of an efficient mulch is desirable for the prevention of evaporation and loss of moisture.

Feeding Copper Carbonate Treated Wheat to Poultry.

Poultry feeding experiments, to test whether the feeding of wheat that has been treated with copper carbonate is likely to be injurious to poultry, were carried out at Wagga Experiment Farm and at the Government Poultry Farm, Seven Hills.

At Wagga farm, a small pen of young birds was fed solely on treated wheat for a period of about three months, while a pen of second-year hens was fed for alternating periods, with treated and untreated wheat. At the Government Poultry Farm, Seven Hills, hens and cockerels were fed with treated wheat for their evening grain continuously for a period of two months, and, as a check, a pen of hens was fed on untreated wheat.

In summing up the results of these experiments, Mr. E. Hadlington, Poultry Expert, points out that it would appear that copper carbonate treated wheat has no ill effects when fed for short periods. It has yet to be proved, however, whether feeding treated wheat for longer periods than the two or three months over which the experiments extended is likely to be harmful.

Farmyard Manure.

Farmyard manure comprises the solid and liquid excreta from animals, and forms one of the universal manures used by most gardeners—complete for all purposes in horticulture. It must, however, be used with care and intelligence. In some places where large and cheap supplies are available the soil is saturated with manure.

The greater the quantity of manure incorporated with the soil, the greater the necessity for plenty of fresh air to bring about decomposition, and ultimately humus. Now, if a soil has not been deeply dug or trenched, and it happens to be of a heavy nature, it is possible that the rains will not pass away readily; then the manure begins to sour, and fresh air with its oxygen is driven out, carbonic acid develops too freely, and the beneficial bacteria are suffocated or annihilated by their enemies, which come into being owing to the lack of fresh air.

To avoid these troubles the soil should be well and deeply dug, and whenever extra large quantities of manure are used, the soil should be afterwards dressed with lime to keep it in a sweet condition.—*Queensland Agricultural Journal.*

Cereals at Bathurst Experiment Farm.

REVIEW TO 1928.

R. THOMSON, H.D.A., Experimentalist, and R. E. P. DWYER, B.Sc., Agr., Assistant Plant Breeder.

WHEAT.

THE breeding of varieties of cereals to suit particular localities has played an important part in the development of wheat-growing in New South Wales. This work has been carried on at Bathurst Experiment Farm for a number of years past, in conjunction with field experiment plots, where the best varieties from the Plant Breeder's plots are tried out over a number of years under field conditions. A review of the results of the past seven years gives an indication of the progress made.

In arranging the varieties into groups two factors are taken into consideration—season and utility. For each group a well-known good yielding variety is taken as a standard for comparison. The wheats have been grouped as follows:—

1. Late dual-purpose—Standard, Cleveland.
2. Mid-season grain—Standard, Federation
3. Early grain—Standard, Waratah.
4. Early dual-purpose—Standard, Gresley.

Late Dual-purpose Wheats.

Bathurst being essentially a mixed-farming district, the demand is for good dual-purpose varieties of wheat and this must be kept strictly in view in the breeding work. Cleveland, a Farrer production specially bred for cooler tableland climates, is a very popular variety and has been a consistent yielder, and the task of evolving a superior sort is not regarded as a light one. Some varieties have, however, been produced by Mr. J. T. Pridham, the chief cereal breeder of the Department, which have been field-tested for some years and it is apparent from these tests that definite progress has been made in this breeding project.

Following are the results obtained from variety trials of late wheats at Bathurst Experiment Farm in recent years:—

TABLE 1.—Grain Trials with Late Dual-purpose Wheats.

Variety.	1921.	1922.	1923.	1924.	1925.	1926.	1927.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Comara	19 36	22 36	21 16	...	...	...	...
Cudgen	18 18	22 53	18 38	29 14	18 5	...	...
Wandilla	...	22 36	17 44	30 14	22 16	16 30	...
Cadia	...	23 40	21 46	26 48	19 57	18 40	12 15
Canimbla	20 12	23 13	20 53	34 26	23 24	20 40	10 15
Cleveland	19 54	18 33	17 36	26 46	18 32	18 00	13 00
Cargo	...	29 57	17 36	25 23	...	19 10	10 20
Carinda (M)*	...	...	...	...	20 19	19 10	10 00
Exquisite	...	...	...	...	...	...	17 20
Turvey	...	...	...	...	...	...	16 25
Condong (M)	...	...	...	...	...	...	15 00
Onas	...	...	...	...	...	...	10 25

* Mid-season variety.

TABLE 2.—Hay Trials with Late Dual-purpose Wheats.

Variety.	1921.	1922.	1923.	1924.	1925.	1926.	1927.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Cadia	1 9	1 16	1 14	2 19	1 15	1 4	0 8
Cargo	...	1 15	1 11	2 14	...	1 2	0 8
Cleveland	1 6	1 10	1 8	2 17	1 10	0 16	0 7
Carinda (M)*	...	...	...	...	...	...	0 8

* Mid-season variety.

From the above yields, it will be seen that Cleveland is seriously challenged by some varieties, notably by Cadia and Cargo as dual-purpose sorts and by Canimbla also as a grain variety. Cadia and Cargo are Cleveland crosses of nearly similar breeding and are also of similar season and appearance.

Cleveland is, however, still regarded by farmers on the Central Tablelands as their standard late-maturing dual-purpose wheat. It is rather disappointing to the plant breeder to have evolved varieties like Cadia, Cargo, and Canimbla, which have proved their superiority over Cleveland as dual-purpose and grain varieties, respectively, and to find Cleveland still largely grown by farmers in Bathurst and similar districts. These varieties have a further advantage in being a little earlier than Cleveland. Carinda and Condong are still earlier varieties which have not yet been sufficiently tested to indicate their comparative value, but Carinda (another Cleveland cross) is very promising.

Other late varieties which indicate from their appearance in the stud plots that they are worth field-testing on the Experiment Farm in comparison with Cleveland, and in districts of similar climatic conditions to Bathurst, are Firwhill (a South Australian wheat which seems a very good hay variety), Bulga (a cross between Federation and a French wheat made by a collaborator in France), and Dilga (a Dart's Imperial x Federation cross from Victoria).

Mid-season Grain Wheats.

Federation is still the standard wheat of mid-season maturity with farmers in the district. It is in reality not particularly suited to the district, and there is distinct need of a good yielding, rust and flag smut resistant variety of similar season to replace it.

Following are the yields of the varieties of this class taken from the early-sown trials at Bathurst Experiment Farm in recent years :—

TABLE 3.—Variety Trials with Mid-season Grain Wheats.

Variety.	1924.	1925.	1926.	1927.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bena	32 30	19 5	16 40	5 55
Carinda	....	20 19	19 10	10 0
Duchess	....	....	15 10	7 45
Condong	....	....	....	15 0
Hampton	....	....	....	5 5

Federation has not been included in these trials, but Carinda compares well with Bena, which probably yields better than Federation. Bena, however, does well only in good seasons and cannot be considered a really reliable variety. If a variety can be evolved, of the same season as Federation or Bena, which yields better for grain, and at the same time is a good dual-purpose wheat, it will probably replace Federation in this district. In addition to the above varieties, those which appear to be worth testing in this respect are Clarke's, Baroota Wonder, Parsee, and Burrill.

Early Grain Wheats.

As in other districts, Waratah has now definitely replaced Canberra as the standard early grain wheat. It not only is an improvement on Canberra in strength of straw and in yield, but in resistance to flag smut.

Following are the yields of early grain wheats in the late-sown variety tests at Bathurst Farm :—

TABLE 4.—Early Grain Wheats in Late-sown Variety Trials.

Variety	1921.		1922		1923.		1924.		1925.		1926.		1927.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Waratah	...		36	52	28	32	39	6	28	12	19	0	19	10
Canberra	12	0	30	26	26	40	32	57	25	30	17	40	15	55
Gresley	11	36	30	26	16	40	30	7	24	7	15	30	14	0
Hard Federation ...	9	18	28	54	26	25	30	31	22	50	...		...	
Duri	...		...		...		34	26	27	36	20	22	12	20
Bobin	...		...		...		...		...		...		14	25

Duri is the only early grain variety which has so far created a favourable impression in comparison with Waratah in field tests, Canberra, Gresley, and Hard Federation being distinctly inferior. In addition to Duri and Bobin, the following varieties are also worth inclusion in these field tests :—Aussie, Bogan, Nabawa, and Yetna. Some new cross-breds, however, appear to be more promising rivals of Waratah.

Early Dual-purpose Wheats.

Although the most widely grown dual-purpose early wheat at present in the Bathurst district, Gresley is not a particularly good variety and it should soon be possible to improve on it. Waratah will yield more hay than Gresley, in addition to being a much more productive grain wheat, and would, therefore, seem to be an infinitely superior dual-purpose wheat. But the colour of the chaff and strong tip beard are against its being used as a commercial hay variety although it is excellent for home use.

Following are the yields of hay from early varieties at Bathurst Farm :—

TABLE 5.—Yields of Hay from Early Dual-purpose Wheats.

Variety.	1923.		1924.		1925.		1926.		1927.	
	tons	cwt.	tons.	cwt.	tons.	cwt.	tons.	cwt.	tons	cwt.
Gresley	1	17	2	19	1	6	1	0	0	19
Bathurst No. 7 ...	2	1	3	0	1	6	1	7	1	1
Waratah	......		3	4	1	14	1	6	1	0

Although Bathurst No. 7 has consistently beaten Gresley in hay yield, it is not a good grain wheat, and cannot be recommended any further at present. The following varieties, however, appear to be equal to or better than Gresley for grain, and are sufficiently promising hay varieties to make them worth field-testing for hay in comparison with Gresley :—Bald Early, Maharajah, Baroota Wonder, Cookapoi. Some new cross-breds are also very promising.

OATS.

With oats, the groups and their objectives are as follows :—

1. Late grain oats—Standard, Algerian.
2. Late hay oats—Standard, Algerian.
3. Mid-season to early grain oats—Standard, Guyra.
4. Mid-season to early hay oats—Standard, Guyra or Belar.

Late Grain Oats.

Algerian has been considered for some time to be the best and practically the only variety of late-maturing oats worth growing for any purpose—grain, hay, grazing, or dual purpose. Varieties which are much later than Algerian, such as Tasmanian Giant, Abundance, and White Tartarian, are too late for the Bathurst district, though the latter variety in particular may be suitable for the colder parts of the Central Tablelands. Since 1925 the Algerian grown as the standard variety at Bathurst has been really Algerian x Red Rust Proof which is indistinguishable from Algerian in appearance, but yields better.

Practically no varieties quite as late in maturing have been available for comparison with Algerian, but the following table shows how mid-season varieties compare with Algerian for grain at Bathurst Experiment Farm.

TABLE 6.—Yields of Mid-season Grain Oats compared with Algerian.

Variety.	1920.		1921.		1922		1923.		1924.		1925.		1926.		1927.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Lachlan ...	30	34	37	36	39	24	39	16	41	36	......		......		...	
Algerian ...	40	20	39	20	48	36	45	20	45	30	20	29	33	4	15	30
Guyra ...	44	26	36	20	49	36	39	28	56	16	24	23	28	17	13	25
Budgery ...	......		......		......		......		......		......		20	18	16	30
Belar ...	......		......		......		......		......		......		22	12	15	20

Guyra has proved about equal to Algerian for grain, but not being as good for hay it cannot yet displace Algerian as a dual-purpose late oat. Some new late crosses give better promise.

Late Hay Oats.

Algerian remains the standard late variety for hay. No hay trials of oats have been conducted at Bathurst Experiment Farm in recent years, but results from farmers' experiment plots in districts of similar climatic conditions, viz., at Tarana, Orange, Neville, Borenore and Carcoar, indicate the superiority of Algerian over mid-season varieties.

Having definitely proved the superiority of Algerian as a late dual-purpose oat, its further testing against the available varieties is robbed of much interest. Some recently fixed cross-breds, representing new varieties, will, however, soon be available. These are Boppy, Bombo, and Lampton.

Mid-season to Early Grain Oats.

Amongst mid-season to early varieties, Guyra stands out as the best grain oat for the Central Tablelands. The following table shows the yields of oats of this class in trials at Bathurst.

TABLE 7.—Yields of Mid-season to Early Grain Oats.

Variety	1920.		1921		1922.		1923.		1924.		1925.		1926		1927	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Ruakura ...	30	33	37	4	40	20	54	25	45	2	......		...		..	
Sunrise (E)*	30	33	26	4	41	20	39	16	41	36	19	2	.....		..	
Guyra (M)†	44	26	36	20	49	36	39	28	56	16	24	23	28	17	..	
Belar (M) ..	......		...		.....		......		...		.....		20	18	16	30
Mulga (E) ...	.....		...		.....		.....		.....		...		24	32	7	20
Laggan (E) ..	.....		...		.....		....		...		...		29	34	8	0
Buddah (E)	......		...		......		.....		...		...		.....		8	10
Gidgee (E) .	......		..		....		.....		...		..		.....		7	35

*E—Early maturing. †M—Mid-season maturing.

It is doubtful whether the early oats as a class will compare with the mid-season varieties in tableland districts. At any rate Guyra will be difficult to replace at least for grain, on account of its productiveness, and also because of its pleasing brown plump sample of grain.

Mid-season to Early Hay Oats.

Guyra is also retained temporarily as the standard variety in this class. No trials of such oats have been made at Bathurst Experiment Farm in recent years, but yields from farmers' experiment plots at Borenore and Carcoar indicate the superiority of Guyra.

Other promising newly fixed cross-breds of this class are now available for testing. These are Kareela, Kendall and Kurri.

The results outlined indicate that definite progress has been made in the production and testing of new varieties at this farm.

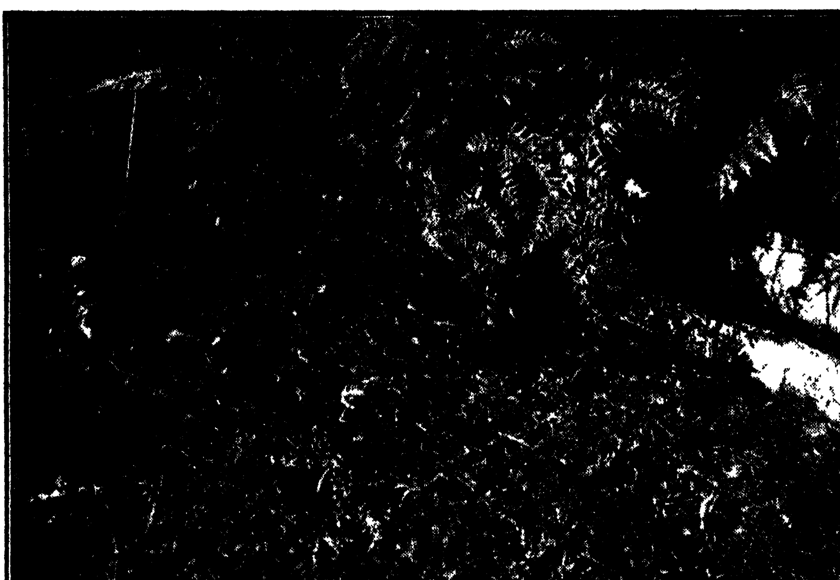
Value of Pasture Plants for the Control of Bracken Fern.

COASTAL AND TABLELAND EXPERIENCES.

J. N. WHITTET, H.D.A., Agrostologist.

PROGRESSIVE farmers in coastal and other districts are making headway in the control of bracken fern by cutting the plant at periodic intervals and planting grasses and clovers which are of a smothering nature.

Kikuyu grass is being used by South Coast farmers at centres such as Berry, Gerringong, Milton, Tilba Tilba, and Eden, for planting on bracken-infested areas, and good results are being obtained. In the central coastal districts, Kikuyu is again proving valuable for controlling the bracken, as trials at Wyong, Wingham, and Copeland have demonstrated.



Poor Heath Country at Woodburn, North Coast.
Carpet grass in foreground; heavy growth of bracken in the background.

Carpet grass (*Paspalum compressum*) has for some years past been used by farmers on the North Coast for planting the bracken-infested areas found on poor quality, sandy heath country. Two years from planting the Carpet grass seed, the bracken diminishes in quantity and good grazing is obtained from the area. These observations were obtained from trials carried out

on Mr. P. McDonald's property at Woodburn. At the end of four years only a few plants of bracken were to be seen on the area sown with Carpet grass. The bracken is brush-hooked just prior to planting the grass seed, and the cutting is repeated as required to allow the grass to become well established. Kikuyu does not thrive as well as Carpet grass on heath country, but gives good results on better-class land.

Subterranean clover is giving promising results in coastal and tableland districts for sowing on bracken-infested country, as it assists in smothering the fern. The value of the clover for this purpose will be greatly enhanced if top-dressed annually, or every second year, with 1 cwt. of superphosphate per acre.

The Same Country, but now a Useful Pasture.

This photograph was taken four years after cutting the bracken and sowing Carpet grass seed.

If land can be cultivated, ploughing and subsequent working, together with cropping the area or sowing it with grasses, will tend to keep the fern in check. If the land cannot be cultivated, the fern should be brush-hooked, or slashed with a piece of fencing wire and the dry material burnt. The country should be heavily stocked when the young ferns are beginning to uncurl, as stock may eat some of the plants and will trample down others. Kikuyu grass roots and Carpet grass seed should be sown in the spring, and seed of the Subterranean clover in the autumn. Sow the seed at the following rates per acre:—Carpet grass, 6 lb.; Subterranean clover, 4 lb. Plant Kikuyu roots 3 feet apart each way in the field.

River Myall or Sally Wattle.

(*Acacia glaucescens.*)

Proved Poisonous to Stock.

H. R. SEDDON, D.V.Sc., and H. C. WHITE, B.V.Sc.*

THIS tree, one of the wattle family, and a native of Australia, grows profusely along the banks of George's River in the vicinity of Glenfield Veterinary Research Station, and its bright yellow blossom is, doubtless, much admired by travellers on the Main Southern railway line as they pass southward from Liverpool. The trees are of an average height of about 20 feet, but somewhat straggly in growth. The foliage is a light ashy-green, the leaves are lanceolate, and the blossoms occur in pendulous spikes, recalling the catkins of the willow—hence the name commonly applied in this district, viz., Sally Wattle. In other places it is known as River Myall.

Acacia glaucescens has the following distribution:—Belowra, Tuross River, Yerranderie, Thirlmere, Mount Jellore, Picton, Marulan, Tallong, Shoalhaven River, Douglas Park, George's River, Liverpool, Nepean River, Sackville Reach, Mangrove Creek, Brooklyn, Murrurundi, Stroud, Nelson's Bay, Denman.

Do not Confuse with *Acacia cheelii.*

Another type of wattle, known botanically as *Acacia cheelii,* was at one time confused with the above, but was found by Blakely to be of a distinct species. It resembles *A. glaucescens* in the following main features, *i.e.*, in general appearance, including size and habit, but is readily separated from it by the dull leaves and the rusty young tips to the branches. The leaves of *A. glaucescens* are minutely silky-hairy, or, when very young, golden-hairy. Further *Acacia cheelii* is distributed differently in the State, being found in the following districts:—East Cundurong, Mudgee, Singleton, Carroll, Quirindi, Murrurundi, Ashford, Warrah, Currabubula, Tamworth, Pallamallawa, Manilla, Page River, Wee Waa, Pilliga Scrub, Narrabri, Bingara, Baan Baa, Warrumbungle Ranges, Boggabri, Warialda.† Moreover, *Acacia cheelii,* which is known in the Narrabri district as "Curracabah," is a good fodder in times of drought, and is not suspected of being possessed of harmful properties.‡

* Research undertaken under the Poison Plants Committee of the Commonwealth Council for Scientific and Industrial Research, and carried out at the Veterinary Research Station, Glenfield.

† For the information as to the distribution of the two species mentioned and their main distinguishing characters we are indebted to Dr. G. P. Darnell-Smith, Director of the Botanic Gardens, Sydney.

‡ From information kindly furnished by Mr. G. Burrows, District Forester, Narrabri.

Local Opinion as to Harmfulness of *A. glaucescens.*

Local residents have informed us that the tree in question (*A. glaucescens*) was poisonous to cattle, and details were furnished of several animals said to have been poisoned by it during recent years. We were not able, however, to see a naturally occurring case, and it was, therefore, deemed advisable to test it. The concensus of local opinion is to the effect that mortality takes place under the following conditions:—(1) During late spring or summer, (2) from the eating of leaves that had fallen and wilted for at least twenty-four hours, and (3) after such stock have had access to water. Stock of all classes seem to be equally affected, but good condition was thought to be a predisposing factor.

With regard to (1), it may be pointed out that it is mainly in the spring that branches would be pulled down—by persons gathering the blossoming tree—and that chiefly then, or in the warmer months following, there would be picnickers about the river, who either pull or cut down the leaf-bearing branches which are normally out of reach of stock. Regarding (2), it is said that cattle will browse with impunity on what green leaves (still on the tree) they can reach, but we were not able to obtain definite evidence of any resident having actually seen a beast have a good feed of such leaves. The relationship of water to the mortality, as mentioned in (3), was based on the fact that cattle, after eating the leaves, were said to go down to the river to drink, and were found dying in the river bed or close by on the banks.

Experimental Investigation.

On 22nd August, 1927, a supply of branches was cut and brought straight to the Veterinary Research Station. The tree was then in bud, but no flowers had appeared. The conclusions arrived at as a result of feeding tests were as follows:—

1. That the leaves of the tree are not readily eaten by either cattle or sheep, even if such have been starved previously, unless, perhaps, cattle that have been in the habit of eating scrub, gum suckers, &c. From the fact that the animals picked at it and then left it, and that it induced some slight salivation, it would appear that it is rather distasteful.

2. That when crude aqueous extracts of it are administered it produces toxic symptoms and death. It is, therefore, definitely poisonous.

3. It is poisonous in the fresh state, also when wilted, and when sun-dried for several days.

4. That the fresh extract is as toxic as that which has been prepared by maceration overnight.

5. That a toxic dose for a grown sheep is contained in not more than 11 oz. of sun-dried leaves, or $\frac{3}{4}$ lb. of fresh leaves, and that sufficient to cause symptoms in cattle is present in 26 oz. of sun-dried leaves, and the indications are that a lethal dose would be contained in such a quantity (say 3 or 4 lb.) that a grown beast might readily

consume when it overcame the apparent distastefulness of the leaves. For pigs, a much larger dose, relatively, is necessary than for ruminants, the extract from 1 lb. dried leaves being toxic for a small pig.

6. That, where a lethal dose has been given, symptoms may appear in a matter of minutes, and death may take place in sheep and pigs at least in under an hour.
7. That the symptoms are suggestive of hydrocyanic acid poisoning. The lesions seen on post mortem examination are neither severe nor extensive, but resemble those seen in hydrocyanic acid poisoning.
8. That the odour exhibited on post mortem examination strongly suggests hydrocyanic acid poisoning.

Further Investigations as to the Toxic Principle.

At this stage the help of Mr. H. Finnemore, of the Pharmacy Department of Sydney University, was enlisted, the authors having previously carried out investigations of other poisonous and suspected plants in collaboration with that officer (and others) under the ægis of the Poison Plants Committee appointed by the Commonwealth Council for Scientific and Industrial Research. To that end we submitted (*a*) stomach contents from a sheep that had been poisoned, and (*b*) leaves of *A. glaucescens*. Mr. Finnemore's examination showed the stomach contents to contain hydrocyanic acid, as we suspected, and which was readily detected; and the leaves were found to contain a cyanogenetic glucoside, but no emulsin.

The tree in question is therefore cyanogenetic, and, though no quantitive estimations have yet been made, we feel no hesitation in ascribing its toxicity to the production therefrom of hydrocyanic acid. As this is possibly the first record of experimental evidence showing an *Acacia* to be poisonous to stock, and the first record of such being suspected of being cyanogenetic, the record is of some significance. It may be mentioned that certain other *Acacias* and *Albizzias* have been suspected of being harmful, and certain have been shown to contain a saponin, to which their supposed poisonous properties have been attributed.

Summary.

Mortality in cattle has been attributed to the eating of *Acacia glaucescens* (River Myall or Sally Wattle), and this tree has been shown by experiment to be toxic for sheep, cattle, and pigs. It is to be regarded as a highly toxic plant. Experiments have indicated that such toxicity is due to cyanogenetic properties in the tree, and this has been confirmed by Mr. Finnemore, of Sydney University.

Further work on this and other *Acacias* is being conducted under the Poison Plants Committee of the Council for Scientific and Industrial Research.

Upland Rice Trials on the North Coast.

Introduction.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

DURING the 1927-28 season the Department carried out trials at Wollongbar and Grafton experiment farms, and on farmers' properties in the Taree and Murwillumbah districts, in order to determine the suitability of North Coast conditions for the growing of upland rice.

The seed for the trials was supplied by Mr. J. Takasuka, of Vinifera, via Swan Hill, Victoria, who had selected and acclimatised the variety—it is called "Takasuka," after himself—for several years past. The conditions said to be most suitable for this variety are an average monthly rainfall of at least 3 inches during January and February, together with an average maximum temperature of 80 degrees or over during those same months.

The method of cultivation advocated by Mr. Takasuka was to use fallowed land that had been worked down fine. Drill the seed in, in double rows about 2 feet apart, and Mr. Takasuka stated that when using an ordinary seed drill he usually allowed two drills to run, stopped the next two, and so on. This lets plenty of light into the growing crop, and also allows room for a horse when working between the rows.

Reports from the officers supervising the trials in the different districts are printed hereunder. Mr. J. M. Pitt, Senior Agricultural Instructor, reported that the trials carried out in the Taree district, on the farms of Messrs. J. Davis and Geo. Levick, were practically complete failures. In these cases, although the season was favourable, the crop did not do well at all, and during a brief dry spell of three weeks the plants withered considerably, and this was just when the seed heads were forming. When examined some time later, the heads appeared to be only partly filled with grain.

Murwillumbah District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

This experiment was planted on Mr. M. B. Cox's farm at Eungella, Murwillumbah. The land was an old paspalum paddock that had been under pasture for some years, the soil being an alluvial loam. The first ploughing, on 11th August, 1927, was very shallow, and was followed by a thorough harrowing to kill the grass. A second ploughing (8 inches deep) was given at the end of September, and the plot then harrowed. Harrowing was also carried out just prior to planting.

Sowing and After-cultivation.

Planting took place on 18th October, 1927, in double rows 8 inches apart, with spaces of 2 feet 3 inches between the double rows. These spaces are

wider than suggested by Mr. Takasuka, but this was done to permit of cultivation with horse implements. Superphosphate was applied at the rate of 2 cwt. per acre at time of planting, and again in December as a top-dressing.

During the early stages of growth, both hand chipping and scuffling were carried out in order to keep down weeds. As the season advanced the continuous wet weather made it impossible to get on to the ground, and eventually the plot was overrun with weeds, Crab grass (*Eleusine indica*) being the worst offender. However, the rice still grew very vigorously and did not appear to be affected by the weeds.

The rainfall during the growing period was as follows:—

	Points		Points
1927—October (18th to 31st)	223	1928—January	1,005
November	1,564	February	2,397
December	670	March (1st to 5th)	65
		Total	5,924

Harvesting.

The plot was harvested by hand on 5th March, 1928, and great difficulty was experienced in separating the rice from the weeds. It was then cured in the barn as the weather conditions were too unfavourable for curing in the open. When dry, several attempts were made to thresh the rice but it was too tough. With the continuance of wet weather, barn space became limited and the rice had to be stacked in a corner where it was attacked by rats, and the yield, therefore, was not obtained.

Comment on Results.

The conclusion to be drawn from this experiment is that rice appears to grow very vigorously, but the limiting factor in its cultivation in this district (apart from the fact that suitable machinery is not available) is weed growth. The plot on Mr. Cox's farm was kept thoroughly clean during the early stages of growth by hand chipping and scuffling, yet it was overrun with weeds before maturity was reached.

Grafton Experiment Farm.

R. J. DAVIDSON, Experimentalist.

A trial was carried out at this farm during the past season with Takasuka variety of upland rice, for the purpose of determining its suitability to the district.

The total rainfall recorded during the past season was above the average, but the distribution was not entirely satisfactory for the rice. During December the registrations amounted to only 111 points, distributed over eight days. This proved insufficient to keep the young crop going, and it suffered a severe check. Exceptionally heavy and continuous rain fell during January and February, and this culminated in a big flood which submerged the plot to a depth of 3 feet for eleven days. The rainfall in

early March was insufficient to meet the needs of the crop which was then at a critical stage of growth. During the latter part of that month, and in April, there was no lack of moisture.

Rainfall on Fallow.

	Points.
August	40
September	375
October (1st to 19th) ...	252
Total on Fallow... ...	667

Rainfall on Crop.

	Points.
October (from 19th)... ...	105
November	398
December	111
January	836
February	1,241
March	363
April	688
Total on Crop	3,742

Cultural Notes.

The site of the plot was a somewhat clayey alluvial soil overlaying a clayey subsoil. The previous crop was maize, in 1926-27. It was disc-ploughed on 29th July, disc-harrowed on 12th September, rolled and harrowed on 10th October, rolled and cultivated in 19th October. As the area was small, shallow drills, 18 inches apart, were opened with a small hand plough, and the seed sown by hand. Date of planting was 19th October, and the rate of seeding 80 lb. per acre.

A good germination was obtained. The plot was inter-row cultivated and hoed to combat weeds and conserve moisture. During December the growth was checked by dry cool weather. The first ears appeared on 1st February. Flood water covered the crop to within a few inches of the ears in February, and this irrigation had the effect of forcing the rice along. It reached a height of 4 feet and gave promise of heading well. However, this promise was not fulfilled. Several weeks of rather drying weather, with hot days and no effective rain, followed the subsidence of the flood, and the grain setting was poor. Harvesting was carried out on 9th May. The heads were cut with a sickle and threshed by hand. The computed yield per acre was 13 bushels 10 lb.

Comment on the Results.

The prospects of developing rice growing commercially under local conditions are not bright. Without irrigation the rainfall is not sufficiently reliable to ensure reasonable prospects of success with the crop. Another difficulty to be considered is the lack of suitable harvesting machinery. No implements are used in coastal farming which could be adapted to handle rice, and the purchase of special machinery is not warranted.

Wollongbar Experiment Farm.

S. C. HODGSON, Experimentalist.

Takasuka variety of rice, which was claimed to be suitable for upland conditions, was given a trial at this farm during the 1927-28 season.

The cultural directions supplied by Mr. J. Takasuka, who supplied the seed for the trial, could not be followed absolutely on account of there being

no wheat drill available. The seed, therefore, was sown by hand on 18th October, 1927, in pairs of rows each 3 feet apart, the single rows in each pair being spaced 8 inches apart. Two such double rows, four chains long, were sown, using hand Planet Junior implements for the purpose.

Cultural Operations.

The land on which the trial was sown was red volcanic loam. It was well prepared, being ploughed in May after maize, springtooth cultivated in July, harrowed in August, again ploughed and harrowed in September, and still further ploughed and harrowed in October before sowing. The soil was thus in good condition at planting time and the rice was given every chance.

Fertiliser mixture M22 (equal parts of superphosphate and bonedust) was applied at the rate of 1 cwt. per acre at time of planting, and a top-dressing of superphosphate was applied at a similar rate on 10th December, 1927.

The germination was only fair, but the growth was satisfactory, and the stooling good. The heavy rainfall gave the rice every chance of success. The first heads appeared on 31st January, 1928—105 days after sowing.

The rainfall during the growing period was as follows:—

1927—October (18th to 31st)	90	points in	5	days.
November	1,161	,,	15	,,
December	720	,,	11	,,
1928—January	1.198	,,	16	,,
February	1,032	,,	22	,,
March	432	,,	19	,,
April (1st to 10th)	152	,,	6	,,
Total	4,785	points in	94	days.

The rice was cut with a sickle on 10th April, 1928, and the seed threshed out by hand. Thus the length of time taken for the crop to mature was 169 days, which approximates the time taken for the variety Wataribune to mature. The yield was at the rate of 550 lb. per acre.

Remarks.

The weeds were very difficult to control, and this factor alone would practically prohibit the growing of this crop on commercial lines in this district. Controlling weeds in this crop is a much more difficult task than controlling them in a very quick-growing crop, such as maize or sorghum.

The sample of rice obtained was badly discoloured, and the yield was far from good. In view of the fact that a better yield was not obtained in a season like the past one, there seems very little to recommend this crop in a medium or bad season. If it could be sown much closer, a greater yield would certainly result, but the weed trouble makes this impracticable.

Potato Culture.

LESSONS FROM POTATO CROP COMPETITIONS.

A. J. PINN, H.D.A., Special Agricultural Instructor.*

ALTHOUGH the potato is, without doubt, the most important vegetable crop, it has probably come in for the greatest share of neglect of any of the important crops. The crop is one that has played an important part in the pioneering of many of our tableland districts. In those "good old days" growers were working on virgin soils which were at their maximum in regard to fertility, and they were faced with little in the way of diseases in the crop. Such conditions made good yields possible with little effort, and it is not surprising that practically no attempt was made at improvement. That phase of potato culture has now passed. Many diseases have appeared, the soil has lost much in fertility through the cropping systems adopted, and working expenses have continually increased. The absolute necessity for increased yields in order to lower the unit cost has never before been more realised than at present.

The Inauguration of Competitions.

With a view to the ultimate uplifting of the potato crop, field competitions were inaugurated in the Southern Tableland. The districts which participated were Batlow, Crookwell, Goulburn, and Taralga. The ready response of growers to join in these competitions speaks well for the future. It is realised by farmers and business men alike that these competitions spur on growers to practise the best known methods in an endeavour to gain honours for their district and themselves.

It is only reasonable to expect that an analysis of the methods adopted by the successful growers should indicate the best cultural methods, the best rotation, the necessity for seed of high-yielding quality, &c. And such is the case, for even now there is sufficient evidence that attention along certain lines has proved beneficial.

Seed Selection a Big Factor.

Perhaps the greatest benefit so far achieved is the more general realisation that potatoes are not inert like stones, but are possessed of life, and like other plants and live stock respond to improvement by selection methods. As an indication of the value of selection from high-yielding roots, the result obtained by Messrs. Johns Bros. in the Taralga competition is perhaps the most outstanding. In the first year's trial, the standard of their plot of Up-to-Date variety was only average, but in last season's competition,

* Paper read at the Sixth Annual State Conference of the Agricultural Bureau, Richmond, 1928.

through using selected seed, the points scored for this variety were among the highest in the district, notwithstanding the fact that the soil was only second quality potato land.

These growers only used tubers for planting that were obtained from plants that produced five marketable tubers or over. At judging time it was possible to compare the crops grown from selected and unselected seed. The difference was most apparent and certainly convinced visitors of the value of selection.

A High-yielding Plant of Factor Variety.

Competitions Help to Eliminate Diseases.

Particularly noticeable in this case was the big improvement, which was apparent, in regard to the elimination of virus diseases. Previous to these competitions it is doubtful if growers fully realised what virus diseases were. The inspection of their crops during the growing period in company with the judge proved educational in this respect, and has done much in bringing about a more serious view of the presence of these diseases and the need for selection of seed in the field. In summarising the value of selection of seed the advantages can be stated as follows :—(*a*) A more uniform stand; (*b*) the elimination of virus diseases; (*c*) the production of more uniform type tubers; (*d*) greater purity; and (*e*) increased yield.

Compare the advantages attendant upon seed selected in the field with the old or common method of selecting from the pit, where the parentage of tubers is not known. Selection from the pit after marketable tubers have been taken out is only helping degeneration of potatoes, as little seed is obtained from roots that produce a big proportion of marketable tubers, and much seed from degenerate roots which produce a large quantity of small seed.

Improving the Cultural Methods.

The competitions have already done much also in indicating the value of early ploughing and spring cultivation. At Batlow, for instance, where a dry spell was experienced during the early period of growth—there was little rain until about February—it was evident to the most casual observer that crops on land that had been thoroughly worked were in striking contrast to those that had not enjoyed such favourable attention.

In the Crookwell competition, where Mr. O. Frost tied for first place, the land was ploughed earlier than in the case of any other plot. Where early cultivation was practised, fertilisers in fairly large quantities were apparently made full use of. This proves the wisdom of securing a high moisture content in the soil by early ploughing and surface cultivation such as weather conditions demand.

Freedom from Second Growth.

The freedom from second growth in soils of uniform moisture content was also noticeable. Freedom from second growth is an indication of higher cutting quality, and the marketable samples are certainly of better appearance. Most of the highest yielding plots were remarkably free from second growth. The value of humus in improving the texture of the soil and maintaining moisture was apparent in the winning plot of Mr. J. Dodds, at Batlow, where a heavy weed growth was ploughed under.

The two winning plots, that of Mr. O. Frost, Crookwell, and Mr. J. Dodds, Batlow, both on old land, were given heavy applications of fertiliser (5 to 6 cwt. per acre), but the cultural methods in both instances were such as provided a good moisture reserve and a satisfactory tilth.

Factors Influencing Cutting Quality.

The best cutting quality in tubers was found in plots where good cultivation was practised. White-skinned varieties are more liable to a yellowing of the flesh than the red or dark-skinned sorts. It is particularly interesting to note that the whitest cutting tubers were from crops that had been hilled. In many of the crops where the harrow only was used for after-cultivation, a distinct yellowing of the flesh was noticeable, owing to so many tubers having formed near the surface.

On the result of the past year only, closer planting of the rows was found to be an advantage, but, no doubt, in a year of less rainfall the same result may not be achieved. Competitors intend planting a greater number of plots next year than previously at the closer distances of 2 feet and 2 feet 3 inches. Next year there should be a number of comparable plots with wide and close planting, and information of a more definite nature should be obtained.

To illustrate the importance of strain of seed, it is interesting to note that several growers' strains came under observation in different districts, and in each case the deductions made on account of virus disease and impurity were practically similar to that on the grower's own farm.

Roguing Important.

That a virus disease can result in almost total failure of a crop was demonstrated in one plot in the Goulburn district, where there was present an infection of 62 per cent. of the crop. This is perhaps an outstanding case, and inquiry revealed that aphides (the suspected carriers of the disease from diseased to healthy plants) had infested the seed tubers when lying on the floor of the shed. In the words of the farmer, " the aphides were literally swarming over the seed." The important lesson to be learned, however, is the necessity of roguing diseased plants from the crop as soon as possible in order to lessen the possible infection of healthy plants.

It seems more than a coincidence that a strain of Factor seed produced the highest yield in the two years that the competition has been carried out at Taralga. In 1926–27 the highest yield was obtained by Mr. R. Laing, who obtained his seed from Mr. W. J. McPaul—this year's winner—who entered the competition for the first time with a plot on his own farm. In another case poor yield was associated with plots planted with a particular strain of another variety.

Standardisation of Varieties.

It is apparent that the competitions have done much also in bringing about standardisation of varieties within a district. Through the failure of Carman variety in so many plots in the Crookwell district competition, farmers have intimated that they are going to change over to Factor or Up-to-Date, which are the standard white-skinned varieties for the district.

It might be asked in what way will these competitions in main-crop districts benefit the coastal potato grower. I have already indicated that strain of seed is apparently an important factor in securing high yield, and these competitions cannot help but bring to light the growers with high-yielding strains. Full benefits will not be secured for some years, as selection work is only now being undertaken seriously. It is the practice of many coastal growers when planting time arrives to go along to the local store and buy whatever potatoes the storekeeper offers, irrespective of their previous history. How infinitely better to be able to deal direct with a grower and secure a high-yielding strain of known purity and freedom from disease, such as should be possible as a result of these competitions.

Catering for the Coastal Grower.

The coastal grower, particularly, requires a line of potatoes free from admixture. He usually harvests his potatoes as soon as they are fit in order to secure the high price that generally coincides with earliness. If the seed he plants contains a big percentage of other varieties it is necessary for him to wait for the late sorts to approach maturity before he can harvest, and this wait may cause him big financial loss.

It is the intention of the Department of Agriculture to encourage the growing of good strains of seed, and with this in view it is proposed to secure seed from the highest-yielding strains indicated by the tableland competitions and conduct strain tests in coastal areas with the varieties that suit these districts.

Marketing.

Much has been said at this conference in regard to marketing, particularly in reference to the establishment of marketing boards. It is my opinion that, in regard to potatoes, it is first necessary for the local growers to give greater attention to the grading of their produce. Each grower should strive to put quality produce into bags which bear his brand, and thus play his part in securing a higher appreciation of the quality of the locally-grown product. It should be realised from what has previously been said that quality can be considerably improved by cultivation methods, green manuring, and seed selection, and proper attention, such as is necessary under these headings cannot be given on large areas.

Graded Potatoes being Loaded from Storage Pit.

Potato growing should be considered more in the light of a mixed-farming undertaking, particularly in conjunction with stock raising, rather than a one- or two-crop farming venture. As part of a mixed-farming proposition in conjunction with stock raising, the use of fodder and grazing crops will be found of great advantage in producing higher yields of good quality tubers, which would compare favourably with the best of the imported produce.

Practise Rotation.

Continuous cropping with potatoes encourages disease, particularly scab. The more extensive use of clovers, especially Subterranean and Red clovers for grazing, will undoubtedly do much to restore fertility in many of our

"worn out" potato soils. It is known from experience in all parts of the world that clover is an ideal crop for increasing potato production and improving quality. In coastal districts the areas planted with potatoes are usually small in comparison with the size of the farms, so that there is no reason why there should be continual cropping of the same land with potatoes each year. It is noticeable that on many coastal farms that farmyard manure is allowed to waste, and owners are buying artificial fertilisers. It would be productive of better results if both were used conjointly. An application of 5 tons of cowyard manure last season resulted in an increased yield of 3 tons of potatoes per acre.

To Control Potato Scab.

It is apparent that there is too large a proportion of "scabby" potatoes from many of our main-crop areas. Rotation of crops will largely overcome this, but it seems desirable that the dipping of seed for scab should be more general. The standard dip is a solution made of corrosive sublimate, 4 oz. in 30 gallons of water, in which the seed is soaked for 1½ to 2 hours. Experiments so far indicate that by the addition of 1½ per cent. of hydrochloric acid to the above solution the time of dipping can be reduced to five minutes, provided the seed tubers are allowed to remain wet with the dip for from 16 to 24 hours. The following results were obtained from treating "scabby" seed according to the methods mentioned :—

Treatment.	Percentage of Scabby Tubers.	
	Batlow.	Crookwell.
2-hour dip	4·1	1·2
5-minute dip	2·7	3·7
Untreated	40·6	70·0

These results certainly prove the efficacy of treatment for scab, and it seems certain that, in order that points are not lost under the heading of "disease" in competitions, farmers will be more inclined to adopt some such treatment. Arrangements are now being made to test a proprietary mixture which appears economical, effective, and practical, requiring only the wetting of the tubers with the solution made from the powder.

It should be borne in mind, however, that planting in diseased soil offsets much of the good effects of treatment of the seed, but apparently not to the same extent in red basalt soils as on lighter type lands.

Sufficient has been said to indicate that the potato crop competitions should prove most valuable in indicating desirable methods to adopt, and with the other remarks relative to the culture of potatoes, there should be sufficient food for thought for those who are interested in the betterment of potato production in New South Wales.

Woodiness of Passion-fruit.

Cause of the Disease Discovered.

R. J. NOBLE, Ph.D., Biologist.

The Woodiness disease of passion-fruit has long been known as a serious disease in New South Wales. The condition is most readily recognised in the fruits, which are quite hard and woody in contrast to normal fruits.

Healthy fruits are somewhat ovoid in shape, and on drying slightly become shrivelled in a characteristic manner. Woody fruits are generally stunted and deformed. They are occasionally spherical in shape, and this feature, coupled with the hardness and purplish leaden colour of the fruit, has given rise to another common name for the disease, viz., "Bullet."

The skin or rind of such fruits is abnormally thickened, and is often accompanied by a certain amount of cracking and scaliness of the outer layers (fig. 1). These fruits can only be cut through with difficulty, and are then observed to contain only a limited supply of pulp of inferior quality. Although the disease is most commonly observed on the mature fruits, symptoms of the disease may be observed in fruits in all stages of development. In severe cases, many of the younger fruits fail to mature and fall from the vines.

In addition to these marked symptoms on the fruit, the disease is also characterised by certain abnormalities of the shoots and foliage of the vines. Such vines generally have a stunted and deteriorated appearance. The leaves, particularly of the terminal shoots, are smaller than normal leaves, and frequently are puckered, curled, and twisted (fig. 2). On closer examination it is seen that such leaves do not possess a normal green coloration, but are either pale yellowish-green or have a mottled appearance, due to the presence of light-green and dark-green areas. Secondary symptoms of the disease may be observed on the older mature leaves. Although at first normal in appearance, such leaves may later develop a series of small, pale-yellowish spots, particularly in the areas between the veins. These spots should not be confused with the discolorations caused by the Brown Spot fungus *Gloeosporium fructigenum*.

The disease is most commonly observed during the winter months, although severely diseased vines may be seen throughout the year. Individual vines only may be affected, or the disease may be widespread throughout a plantation. Slightly diseased vines, which have produced a few woody fruits during the winter months, may subsequently produce normal fruits during the summer months, but such vines are not as productive as normal vines.

Although the disease is most apparent on older vines, close examination will often reveal that it is present in young vines, and even in young

seedlings, and it is most important that the symptoms of the disease on the leaves and shoots should be fully appreciated in order that control measures should be most effectively applied.

Many different theories have been advanced as to the cause of the disease, but it has now been established that it is due to the action of a virus.* The virus is infectious in character, and is present in the sap of diseased vines. Diseased vines represent sources of infection, and are, therefore, a menace to adjacent healthy vines.

The disease was readily transferred by mechanical means in the infection experiments, and it is very likely that this is the most common method of transmission of the disease under field conditions. Infection may be carried

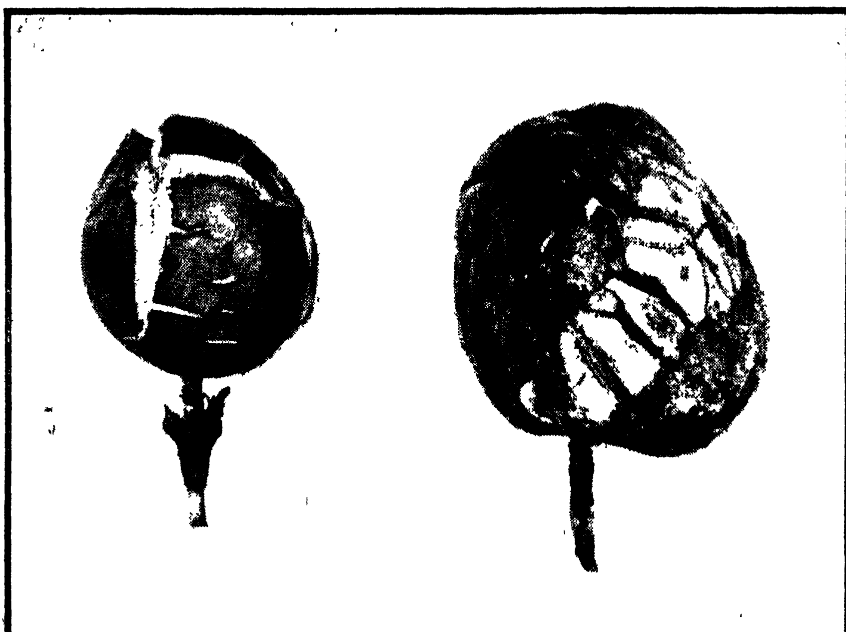


Fig. 1.—Passion Fruit Affected with Woodiness.

on the hands of those working among the vines when pruning, rubbing off the early shoots, and in tying the vines to the supporting stakes and wires. Insects which feed on diseased vines and then migrate to healthy vines may also be concerned in spreading the disease. Passion vines, however, are not very subject to visitation by insect pests, and this aspect is probably not of great importance under commercial conditions.

* Noble, R. J.; Some Observations on the Woodiness or Bullet Disease of Passion Fruit.—*Jour. Proc. Royal Society of N.S.W.*, 1928 (in press).

Control Measures.

1. Seedlings should not be raised in proximity to diseased vines. The seedlings should be closely inspected at frequent intervals, and those showing signs of disease in the leaves should be removed and destroyed. Only healthy seedlings should be planted out.

2. After planting out, the vines should be carefully and systematically inspected at intervals, and again any diseased vines which are observed should be immediately removed and destroyed. Such vines should not be pruned. Replacements may be safely made shortly after removal of the diseased vines. The hands and knives should be well washed in soapy water after dealing with a diseased vine and before working with healthy vines.

Fig. 2.—Terminal Shoot of Passion-fruit Vine Affected with Woodiness.

3. When the disease is observed to be fairly widespread in an older plantation, the vines should never be pruned in October or November with a view to the production of a winter crop. Such action will result in removal of the summer crop, and the subsequent winter crop will contain a high percentage of worthless woody fruits.

4. Older areas of vines should be cut down and destroyed as soon as they become commercially unprofitable. They should not be allowed to remain in a neglected condition, as they are a source of dangerous infection to adjacent young vines.

5. Severely diseased individual vines in older plantations should be first cut off at the ground level and allowed to dry out before removal. This procedure is less likely to cause injury and subsequent infection of the adjacent vines which have become intergrown with the diseased vine on the supporting wires.

6. Remove all weeds and other material which may harbour insects in proximity to the vines. Sprays cannot be applied effectively to passion vines under commercial conditions, thus it is all the more necessary for other means to be adopted to minimise possible insect infestation.

Pollination of Packham's Triumph Pear.

A Preliminary Report on Artificial Pollination Tests.

H. BROADFOOT, Senior Fruit Instructor, and R. E. P. DWYER, B.Sc.Agr., Assistant Plant Breeder, Bathurst Experiment Farm.

MANY commercial orchardists in some districts have complained of the poor setting of the Packham's Triumph pear in their orchards, even when the trees are surrounded or interspersed with varieties which blossom at the same time. Many causes may account for unfruitfulness of a variety of a fruit such as the pear; in general, these causes may be grouped under two headings, viz., (1) those internal to the plant; (2) those external, which more directly concern its environment. These two are sometimes interdependent.

Under the first heading we may have (*a*) "sterility from impotence," when one or both of the sex organs fail to develop; (*b*) "sterility from incompatibility" when, though the sex organs are completely formed, they fail to function properly; (*c*) "sterility from embryo abortion," when fertilisation actually takes place, but abortion occurs before maturity of the embryo is reached; this covers the phenomenon of the dropping of fruit at an early stage.

It is not so much self-sterility which is of interest, for most fruits are naturally adapted to cross fertilisation, which, however, is made difficult owing to the development of certain flower characteristics in the species or variety. Most fruit-growers are aware that it is injudicious to expect a good setting of fruit from the "solid" planting of a variety—even though in some years a good setting may result in certain varieties—and usually avoid such a condition. It is rather information concerning the inter-fruitfulness of a variety, *i.e.*, the ability to set and mature fruit when pollinated by other varieties, that is of more practical concern.

Until comparatively recently, it has been the rather general belief that most fruit varieties are inter-fruitful, even though they may be self-sterile, provided they bear good pollen. Though there is now some doubt on this point, it is regarded by practical orchardists to be of much significance that some varieties will fertilise an apparently self-sterile variety better than others.

Since the establishment of a Plant Breeding Branch in the Department of Agriculture, some of these pollination problems of the orchard are being investigated under New South Wales conditions for the benefit of growers. Orchardists have tried to throw some light on the problems as to which are the best varieties to fertilise reputedly self-sterile ones, by hanging fresh limbs in more or less isolated trees of the self-sterile variety—a practical method which is not always free from error. Though such tests are of

value in certain cases, it was considered that definite artificial pollinations to provide such data for comparison would be more accurate. Arrangements were, therefore, made for Assistant Plant Breeders R. E. Dwyer, B.Sc.Agr., and N. S. Shirlow, B.Sc.Agr., stationed respectively at Bathurst Experiment Farm and Hawkesbury Agricultural College, to carry out artificial pollinations with different varieties on the Packham's Triumph pear.

It is noteworthy that growers of the Packham's Triumph in different parts of the State have had varied experiences in the setting ability of this variety. On the Murrumbidgee Irrigation Area, and in the coastal areas, as well as at Batlow, Lavington, and Young, the trees have cropped satisfactorily provided they were in reasonably close proximity to other varieties. In the last three districts mentioned, Josephine des Malines is looked upon as the most suitable variety with which to cross-pollinate the Packham's Triumph. In Orange and Bathurst districts Packham's Triumph is held to be decidedly self-sterile and difficult to fertilise even under the most favourable conditions—when, for instance, grown in close proximity to other varieties which blossom at the same time—to set its fruit poorly, and to yield little or no profit to the grower. It is stated, moreover, in those districts where trouble is experienced now in the setting of Packham's Triumph pear, that it was satisfactory in this respect for some years after it was distributed by the late Mr. Packham.

A Self-sterility Trial.

It was thought advisable, first to try and find out whether the variety was really self-sterile. With this object in view, numerous flowers were bagged in large glacine bags before they had opened to insect pollination, any open flowers being removed before bagging. No further treatment was given except that the bags were removed when blossoming had finished.

The following results were obtained:—

	No of flowers bagged.	No. set	Percentage set
Bathurst Experiment Farm	493	6	1·22
Hawkesbury Agricultural College, Richmond...	300	35	11·6

This work is not being finalised on one season's results, but it is felt that a preliminary report should be given at the present stage. The above figures bear out to some extent the experience of orchardists with the Packham's Triumph pear.

Practically all varieties of fruit are self-fertile to a small extent, though not sufficiently so to be planted in solid blocks. The figures given above show that the flowers of Packham's Triumph are naturally self-pollinated to a greater extent at Richmond than at Bathurst. A similar difference is also borne out between the two places in the figures for artificial pollination of Packham's Triumph with different varieties, as will be seen later.

There is, of course, a possibility, but not a great likelihood, that different strains of Packham's Triumph exist, and some growers think this is so. There is, moreover, a possible chance that the variable nature of the stock used for pears affects the fruit-setting of the tree. These phases will be investigated by the mutual transference of bud wood and stocks from the districts.

Factors which Influence Fruit Setting.

The greater probability, however, is that climatic conditions or external factors operate to influence the setting of the Packham's Triumph pear. Of these influences there may be the following:—

(*a*) Exhaustion or weakening in certain seasons of over-production of fruit.—Drought or poverty of the soil has been known to induce the production of many defective pistils (female parts of the flower) the following spring.

Weakness of blossom buds is often caused by complete neglect or perfunctory performance of cultural operations, and by tree exhaustion following the carrying of an abnormally heavy crop of fruit during the previous season. The latter may be accentuated by the former, or by the occurrence of a period of rainfall much below the average.

To induce the formation of good, healthy blossom buds the orchard must be kept in a good state of tilth, growth of weeds must be prevented to restrict loss of moisture by transpiration, and a good surface mulch must be maintained to prevent loss of moisture by capillarity. Weakness of blossom buds results, as might be expected, in weak or defective organs of reproduction, which, being unable to function vigorously, result in a poor setting of fruit.

Another common cause of weakness of blossom buds is the overcrowding of spurs, especially on old trees. This should be prevented, otherwise there will be a loss of vitality and, as a result, blossom buds will be overcrowded and weak.

It is worthy of note that when trees are kept in a healthy state their leaves grow to good size, and that when leaves are large and well-developed the setting of fruit is always much better than when foliage is scanty and leaves are under normal size. This is not to be wondered at since the leaf is the laboratory in which raw food material is manufactured into organised food, which is necessary to the vitality of the tree and to the energy involved in its life processes. The better developed the leaf, the more efficiently does it carry on its work with benefit to the tree and to its produce.

(*b*) Locality effect on soundness or defectiveness of pistils.—Soil and locality play an important part in connection with the setting of fruit. A primary essential confronting the intending orchardist is to secure a block of suitable soil in a locality which has a climate suitable to the kinds of fruit which he wishes to produce. Even in recognised fruit districts one will find wide variation in soil and aspect, and it is always noticeable in any district that a certain variety of fruit may do much better in some parts than in others. Even in the same orchard, and with the same varieties worked on similar stocks and treated in the same way, there will be wide divergence in productivity and quality of fruit.

(*c*) Seasonal effects.—One of the greatest of the factors which adversely affect the setting of fruit is continued wet, cold weather during the blossoming period. Such weather conditions injure the delicate essential organs of the plant to such an extent that they cannot function properly, and, in

addition to this, such weather conditions interfere with the activities of the bees, which carry pollen from flower to flower. As a result of this interference many flowers are not pollinated. Hot, dry winds also damage the reproductive organs to such an extent that full fruition is interfered with, and they also interfere with bee activity.

To the foregoing deterrents, heavy frosts which occur after the buds have begun to develop, especially from pinking stage to full bloom, must be added. Amongst the pears which are very susceptible to damage by frost may be placed Packham's Triumph and Gansell's Bergomot. Frosts have proved destructive to these varieties when others—Williams, for instance—at the same developmental stage, and growing alongside those referred to, have been uninjured.

(*d*) Age of tree.—There is a wide variation in the time it takes different varieties of pears to commence cropping, even though they may be worked on the same stock, planted in the same class of soil and growing in the same locality, and receiving similar treatment as regards pruning, spraying, cultivation, &c. The Josephine des Malines, for instance, takes much longer than the Williams to commence cropping. In the Batlow district the former variety has taken up to fourteen years before it has carried a payable crop, whilst the latter variety (Williams) growing in the same orchard, has carried good crops at eight years. It might be pointed out that, although the Josephine has not cropped up to the age mentioned, it has blossomed most profusely for a number of years before cropping. It is clear from the above that the age of different varieties, even when grown under similar conditions, is an important factor with the setting of fruit. The Packham's Triumph, as a rule, commences cropping at a fairly early age.

(*e*) Temperature.—The effect of temperature on fruit setting may be fourfold, viz.:—(1) Damage of the pistil by frost; it has been the experience of one of the authors (Mr. Broadfoot) that Packham's Triumph is very susceptible to damage by frost, especially in the bud stage from early pinking to full bloom. (2) Effect on germination of pollen. (3) Effect on length of time the stigma (female part) is receptive. (4) Effect on pollen-carrying insects.

(*f*) Rain at blossoming.—This is recognised generally as one of the most important factors limiting the set of fruit.

(*g*) Wind.—Most deciduous trees are insect-pollinated, but a reasonable amount of wind at blossoming time is a distinct aid in securing a good set of fruit. This may have some influence in pollinating flowers on the same tree, but the pollen is usually so sticky that very little transference of pollen from one tree to another can be expected by means of wind. In strong wind, bees and other pollen-carrying insects refuse to work. Strong wind may also operate directly in whipping the flowers about and causing mechanical injuries to the pistils. It may also shorten the time of receptivity of the stigma by drying up the stigmatic fluid that is necessary to moisten the pollen grains to enable them to germinate.

(*h*) Effect of spraying trees when in bloom.—The use of some sprays, such as nicotine extract, during the blossoming period has little or no effect upon the blossom, but such sprays as lime-sulphur and Bordeaux mixture should not be used during the blossoming period, especially when that period is at its height. Many cases are known in which a grower has sprayed with lime-sulphur during the blossoming period, and has had a good setting of fruit, but on the other hand injurious results may follow the use of the same spray during the same period. Much depends upon the climatic conditions and the condition of the tree. The reaction to the spray referred to is not always constant, and the risk of applying it during blossoming periods should not be taken. The prudent and industrious orchardist who keeps ahead or abreast of his spraying programme has no need to jeopardise his crop with those sprays which would involve risk during the period referred to. The risks he takes are damage to essential organs of reproduction and repulsion of bees which function as carriers of pollen from tree to tree. Nicotine is sometimes used for thrip during the blossoming period. As already indicated, its use is perfectly safe at that or any other period of the plant's history.

(*i*) Extent of parthenocarpy, *i.e.*, the ability of trees to develop fruit without fertilisation.—There are, as is well known, some varieties of pears which in many localities will develop fruit without fertilisation, but, generally speaking, pears, or at least all the commercial varieties, will set and develop their fruit much better when fertilisation has taken place and the fruit contains plump seeds. The failure of a large percentage of pear blossoms to set, and the heavy loss of immature fruit, usually just after it reaches the calyx stage, is due principally to poor pollination, and the fact that a large proportion of the dropped fruits have fewer seeds than those which are retained on the trees indicates that seed development (one resultant of pollination) is an important factor in the setting of fruit. In some seasons, too, it is very noticeable that in certain varieties of fruit there is a good deal of malformation—one side of the fruit being well- and the other side ill-developed. The good side has plump seeds and the poor side no seeds. This is a sign of partial fertilisation.

(*j*) Effect of insect pests, *e.g.*, the mechanical injury to the essential organs by thrips.—The Orchardist at Bathurst Experiment Farm attributed the poor setting of the 1926-27 fruit crop to be partially due to the heavy thrip infestation. Thrips are the only insect pests which in certain seasons in this State are responsible to any extent for a poor setting of fruit. In some seasons they appear in millions, and enter the blossoms before the petals are fully expanded. They attack the essential organs of the flowers, which are killed before they have reached maturity, and as a consequence a poor setting is the result. The trouble is accentuated when blossom buds are weak, as such buds are slower in development and the thrip has a longer period in which to carry out its destructive work.

(*k*) Presence of fungous and bacterial diseases.—In the aggregate very little loss occurs in this State from disease, but in some seasons in certain

localities individual growers have sustained heavy losses—usually the result of neglect to take necessary precautionary measures. The chief losses have followed neglect of suitable measures against black spot during the "spur burst" and "pink" stages, when climatic conditions have indubitably indicated their necessity. As black spot attacks and destroys embryonic fruit and the pedicel, it is responsible for poor setting when it occurs.

(*l*) Effect of stocks.—There is no doubt that the stock has a decided influence upon the growth and productivity of a tree. Many pear trees in the same orchard, on the same class of soil, and receiving similar treatment, frequently show marked variation in growth and in quality and quantity of fruit. Since this is the case, the cause of such divergencies must be the difference in the stocks. There are, of course, various causes of barrenness and of poor tree growth, but the unsuitability of many of the stocks used is scarcely a matter of doubt. This is not to be wondered at in view of the great variety of stocks used and the wide range of origins represented. They are raised from suckers, by root grafting, from cuttings, from locally selected and foreign seeds, and too often, it is to be feared, selected without regard to character of parentage.

Artificial Pollination Tests.

The following results were obtained with artificial pollination:—

Hawkesbury Agricultural College.

	No. of flowers pollinated.	No set	Percentage set
Packham's Triumph x Clapp's Favourite ...	112	45	40 0
,, x Williams	100	55	55 0
,, x Josephine	100	58	58·0

Bathurst Experiment Farm.

Packham's Triumph x Williams	160	3	1·9
,, x Baronne de Mello ...	220	7	3·2
,, x Doyenne du Comice ...	146	8	5 5

These preliminary results indicate that the pollination of Packham's Triumph pear is of much greater concern at Bathurst than in the coastal districts. The normal insect pollination of the variety at Bathurst was found to be only 4 per cent., which is much too low a setting to make this variety popular in this district. The results also indicate that of the three varieties tried by artificial pollinaton, Baronne de Mello and Doyenne du Comice are likely to be better than Williams for interplanting with Packham's Triumph to improve the setting of fruit; these varieties also are sufficiently good in themselves to be useful commercial additions to the pear orchard. Although the figures obtained at Bathurst are not high, and do not yet constitute a successful setting (which should normally be about 10 to 15 per cent.), it seems that the varieties mentioned are better than the Williams in this respect.

With most deciduous fruits it is reckoned that every third tree in every third row will provide sufficient pollen for the remaining 89 per cent.

Ordinarily, one colony of bees to each 1 or 2 acres of orchard, depending on conditions, will produce satisfactory results, and sometimes they will take care of a considerably larger acreage.

This work on pollination studies with Packham's Triumph pear will be repeated with the same and additional varieties. Meantime, as far as possible, observations will be made in addition in orchards in which certain varieties are interplanted with Packham's Triumph. So far it has already been noticed that the two varieties mentioned—Baronne de Mello and Doyenne du Comice—appear to be more effective under actual natural conditions for improving the setting of Packham's Triumph than Williams, which is the variety mostly found interplanted with Packham's at present.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kyong School, Moss Vale	2	3 Aug., 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 „ 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	113	20 „ 1928
Department of Education, Mittagong Farm Homes	30	22 „ 1928
Marist Brothers' Training School, Mittagong	80	25 „ 1928
Blessed Chanel's Seminary, Mittagong	3	26 „ 1928
Walaroi College, Orange	4	2 Sept., 1928
J. L. W. Barton, Wallerawang	16	11 Oct., 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	19 „ 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 „ 1928
Department of Education, Hurlstone Agricultural High School	33	10 „ 1928
Department of Education, Eastwood Home	16	16 „ 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 „ 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 „ 1928
Lunacy Department, Callan Park Mental Hospital	20	26 „ 1928
Miss Brennan, Arrankamp, Bowral	24	29 „ 1928
Mr. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 „ 1929
New England Girls' Grammar School, Armidale	17	12 „ 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 „ 1929
Lunacy Department, Kenmore Mental Hospital	99	17 „ 1929
Tudor House School, Moss Vale	6	22 „ 1929
Lunacy Department, Orange Mental Hospital	3	23 „ 1929
William Thompson Masonic Schools, Baulkham Hills	29	23 „ 1929
Australian Missionary College, Cooranbong	57	24 „ 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 „ 1929
P. F. Mooney, Calala	33	16 „ 1929
Department of Education, Gosford Farm Homes	16	16 „ 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 June, 1929
Dominican Convent, Moss Vale	4	26 „ 1929
Sacred Heart Convent, Bowral	10	21 July, 1928
St. Patricks College, Goulburn	8	26 „ 1929
Presbyterian Ladies College, Goulburn	1	26 „ 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929

—MAX HENRY, Chief Veterinary Surgeon.

Packing Peaches in the Grape Case.

W. W. COOKE, Senior Fruit Instructor.

ALTHOUGH the Australian half-bushel case (18 x 8⅝ x 7⅛ inches) appears to be quite satisfactory for packing all commercial sizes of peaches, especially when some of the cases are made up with a depth of 8⅝ inches, and others 7⅛ inches deep*, some fruit-growers prefer a case not so deep, so that the weight of the fruit in the top tiers may not injure those in the lower part of the case.

The case largely used for grapes, plums, etc., which is 18 inches long, 11¾ inches wide, and 5¼ inches deep, usually made up with a hinged lid, is also used to some extent for the packing of peaches, and whilst there is no doubt that the peaches carry well in this case if properly packed, the difficulties of packing met with in attempting to pack various sizes of fruit to a standard pack in this case are far greater than with the Australian half-bushel case.

Case 18 x 5¼ x 11¾ in. deep.

Packing trials were carried out at Yanco Experiment Farm last season, to determine, if possible, the best way to pack a "grape" case, and to compile a chart of the different packs. It was found that only one or two sizes packed well in the case as usually made up, i.e., with a depth of 5¼ inches, the case being too shallow; but most sizes packed fairly well when the depth was 11¾ inches. To get this depth, the side to which the hinged lid is tied is removed, and the lid nailed down. If it is not desired to nail the lid down, it can be held in place by an iron hook and a couple of small wooden wedges while packing and until the side is replaced, when it can be tied down in the usual manner. This gives a case 18 inches long, 5¼ inches wide, and 11¾ inches deep, as shown in the illustration.

Peaches ranging in size from 2⅞ to 2⅛ inches (these sizes include most of the commercial peaches) were tested and a chart compiled. This chart gives two packs (1-1 and 1-2) and nine counts, or ten if the alternate pack for 2¾ inches is included.

The fruit, with all the counts, excepting 1-1 7-6, packed best on the flat, with the stem end pointing to the bottom of the case, excepting in the case of the last tier, where the stem end points to the lid. This not only brings

* Packing peaches in these cases is described in a free leaflet—"The Packing of Peaches"—which can be had on application to the Under Secretary, Department of Agriculture.

the fruit up to the correct height, but protects the apex of the peach from being bruised by the bottom or the lid of the case. Also when the case is opened in the usual way, i.e., by opening the hinged lid, the fruit is shown packed on the side, and is thus presented in the most attractive manner.

Although it will be seen from the above notes, that it is possible to pack peaches successfully in the "grape" case, and that they will, no doubt, carry well in this case owing to its shallow depth of 5¼ inches, the narrow width, when made up as suggested, prevents the use of both hands, a consideration which makes the Australian half-bushel case the better of the two.

Chart showing packs and approximate sizes of peaches in case made up with a depth of 11¾ inches is given hereunder:—

Pack.	Tiers.	Row count.	Total in case.	Approximate size of fruit.	Remarks.
				inches.	
1–1	5	6–6	60	2⅞	Packed stem end down, except the last tier, which was reversed. Height about right. Opens up well
1–1	5	7–6	65	2¾	Comes up rather low with flat types when packed on the flat.
1–1	5	7–7	70	2¾	The same sized fruit packed on side. Height just right.
2–1	6	4–4	72	2⅝	Height about right. Packed on the flat with stem end down, excepting last tier, which is reversed.
2–1	6	5–4	81	2½	Placed in same manner as 4–4 above. Height right. Opens up nicely.
2–1	6	5–5	90	2⅜	Placed in same manner as 4–4 above. Requires to be packed rather tightly, or comes up too low.
2–1	7	6–5	116	2¼ (full)	Placed in same manner as 4–4 above. Comes up too high if packed tightly.
2–1	7	6–6	126	2¼	Placed in same manner as 4–4 above. Height just right.
2–1	7	7–6	137	2¼ (bare)	Placed in same manner as 4–4 above. Height about right.
2–1	7	7–7	147	2⅛	Placed in same manner as 4-4 above. Comes up rather low.

NOTE.—In column 5, "2¼ inches full" means that most of the peaches are just under 2⅜ inches, and "2¼ inches bare" means that the bulk are just 2¼ inches, or mostly at the 2¼-inch end of the range.

The above chart is for average-shaped peaches. In the case of either very long or very flat peaches, the counts and sizes will not correspond with those shown above.

DAIRY SCIENCE SCHOOLS.

BUTTER factory employees who are desirous of qualifying as cream graders and milk and cream testers under the Dairy Industry Act are reminded that Dairy Science Schools are to be conducted by the Dairy Branch of the Department of Agriculture at the following centres on the dates specified:—Hexham (10th to 14th September), Nowra (17th to 21st September), Bega (24th to 28th September)—L. T. MACINNES, Dairy Expert.

PERDRIAU TYRES

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Quantity Estimations on the Farm.

W. McCARROL, Lecturer in Surveying and Farm Accounts, Hawkesbury Agricultural College.

In estimating volumes, it is best to consider all problems from first principles, and to find first the area of a uniform section of the solid under consideration, and then multiply this area by the length through which it extends.

Household Tanks.

Simple examples are household tanks. In the case of a square or rectangular tank, the area of the base extends uniformly from the bottom to the top of the tank, *i.e.*, through a distance equal to the height or depth of the tank. Hence to obtain the volume of such a tank, multiply the area of the base by the height of the tank.

The area of the base = length × breadth; thus the volume of the tank = (length × breadth) × height.

A ship's tank (Fig. 1) provides a simple illustration :—

The volume of the tank $= l \times b \times h = 5 \times 5 \times 5$ cubic feet = 125 cubic feet.

There are $6\frac{1}{4}$ gallons in a cubic foot of water, so that to calculate the number of gallons of water in any tank it is necessary to multiply the volume in cubic feet by $6\frac{1}{4}$.

The number of gallons of water in the tank illustrated in Fig. 1 would thus be $125 \times 6\frac{1}{4} = 125 \times \frac{25}{4} = 781\frac{1}{4}$

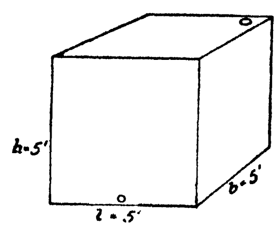


Fig. 1.- A Square Tank.

With round or cylindrical tanks the bottom area (circular in this case) is again a uniform section extending through a distance equal to the height of the tank. The area of the base $= \frac{\pi d^2}{4}$ where $\pi = \frac{22}{7} = 3{\cdot}1416$, and d = diameter of tank.

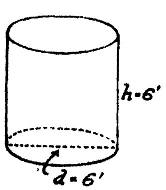


Fig. 2.—A Round Tank.

In the example given in Fig. 2

$$\text{Volume} = \text{Area of base} \times \text{height}$$

$$= \frac{\pi d^2}{4} \times \text{height} = \frac{22}{7} \times \frac{6 \times 6}{4} \times \frac{6}{1} \text{ cubic feet.}$$

$$\text{Capacity in gallons} = \frac{22}{7} \times \frac{6 \times 6}{4} \times \frac{6}{1} \times \frac{25}{4} = \frac{7{,}425}{7}$$

$$= 1{,}060\tfrac{5}{7}$$

In practice the capacity of the tank would be stated as 1,060 gallons. In measuring the diameter of a round galvanised tank, the measurement would be taken to correspond with the centre of the corrugations.

Drains.

Where it is desired to know the amount of earth removed (in cubic yards) during the construction of an ordinary drain, say, 4 feet wide at the top, 2 feet wide at the bottom, 4 feet deep and 100 yards long (Fig. 3), the uniform section is the end of the drain, which is a trapezoid in shape, and runs throughout the whole length of the drain.

$$\text{The area of this end section} = \frac{\text{sum of parallel sides} \times \text{height}}{2}$$

$$= \frac{(4 + 2) \times 4}{2} = 12 \text{ square feet.}$$

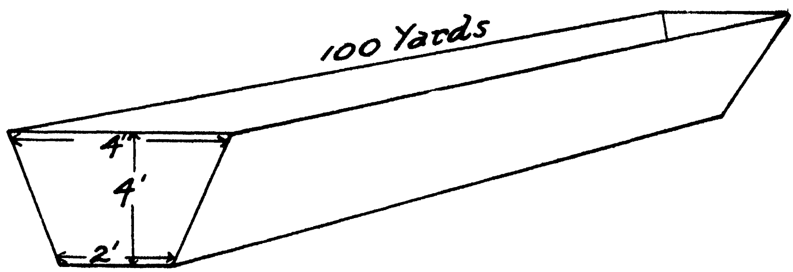


Fig. 3.—A Section of a Drain.

All measurements must be in the same unit, *i.e.*, all in feet or all in yards, &c., so that it is necessary to multiply the length (100 yards) by 3 to convert it into feet.

$$\text{The volume of the drain thus} = 12 \times 100 \times 3 \text{ cubic feet} = \frac{12 \times 100 \times 3}{27} \text{ cubic yards.}$$

$$= 133\tfrac{1}{3} \text{ cubic yards.}$$

Pit Silos.

Fig. 4 represents an ordinary silage pit having sloping ends and straight sides. The side (a trapezoid), in this case, is a uniform section, extending through a distance equal to the width of the pit.

$$\text{The area of the side} = \frac{(60 + 24)}{2} \times \frac{6}{1} \text{ square feet.}$$

$$\text{The volume of pit} = \frac{(60 + 24)}{2} \times \frac{6}{1} \times \frac{15}{1} \text{ cubic feet.}$$

$$= \frac{84}{2} \times \frac{6}{1} \times \frac{15}{27} \text{ cubic yards} = 140 \text{ cubic yards.}$$

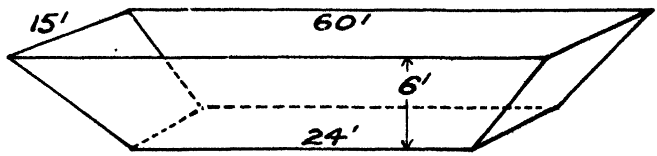


Fig. 4.—Diagram of a Pit Silo.

The volume in cubic yards would be required where the pit was dug by contract at so much per cubic yard, but a more important calculation is the number of tons of silage the pit will hold. It may be taken that 2 cubic yards of silage equal 1 ton, so that to work out the number of tons of silage in the pit, divide the number of cubic yards by 2.

The capacity of the pit represented by Fig. 4 $= \frac{140}{2} =$ 70 tons.

Hay Sheds.

If the full capacity of a hay shed is required, the measurements taken will be those of a stack under the shed, and allowance made for settling of the hay. If the volume of a stack already under the shed is required, the measurements are readily taken.

In the case of hay sheds the end section is uniform throughout the length of the stack. The area of this end section is found by adding the rectangular area to the triangular area, and the volume of the shed or stack = end area × length.

Taking Fig. 5 as an example :—

Area of rectangular portion	$= 30 \times 15 = 450$ square feet.
Area of triangular portion	$= \frac{30 \times 10}{2} = 150$,,
Area of end	$= 600$ square feet.
Volume of shed	$= 600 \times 60 = 36{,}000$ cubic feet.

The number of tons of hay in the stack will vary with a number of factors :—

(*a*) Size of stack—in large stacks compression will be greater, and the hay heavier for a given volume.

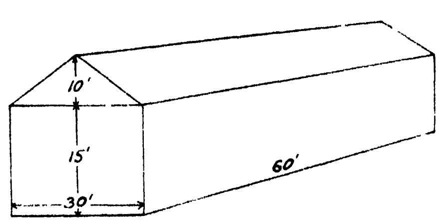


Fig. 5.—Diagram of a Hay Shed.

(*b*) Age of stack—settling, with resulting compression, increases with the age of the stack.

(*c*) Condition of hay—whether in sheaves or loose.

(*d*) Sort of hay—lucerne, wheaten, oaten, &c.

(*e*) Quality of hay—the ratio of grain or leaf to stalk.

The following table gives the number of cubic feet of hay of various kinds to the ton for various periods after completion of stacking, the figures being the result of actual experiments:—

CUBIC Feet of Hay to the Ton.

Period after Stacking.	Oaten.		Wheaten.		Lucerne.
	Sheaf.	Loose.	Sheaf.	Loose.	
Immediately on completion of stack.	350	400	400	500	Varies greatly from 400 to 300 cub. ft. to the ton.
One week after	325	375	375	450	
One month after	300	350	350	400	
Twelve months after ...	300	325	350	400	

At Bathurst Experiment Farm, wheaten hay averaged 297 cubic feet to the ton, and loose straw 892 cubic feet to the ton. Any figure taken can only be approximate. The figures in the above table will serve as a guide, and indicate that little or no settling takes place after the first month.

If it is assumed that the shed illustrated in Fig. 5, which has a volume of 36,000 cubic feet, contains sheaf wheaten hay, the number of tons of hay in shed $= \frac{36,000}{350} = 102 \cdot 8$. The capacity of this shed would be a little more than 100 tons.

The area of the end of the shed illustrated in Fig. 5 might be calculated in one step, instead of two as shown above, by considering the top triangular portion equal to a rectangular portion half its height. The end is then a rectangle 30 feet wide by $(15 + \frac{10}{2})$ feet high, and its area $= 30 \times 20$ square feet $= 600$ square feet.

It would be a good plan for farmers to work out the number of cubic feet of hay to the ton in their particular stacks. This can be done as follows:— Cut out a truss of hay from about half-way up the stack, weigh it, measure the space it occupied in the stack, and estimate the number of cubic feet to the ton. For example, if a truss is cut from a stack 1 yard square by 1 foot deep, and is found to weigh $57\frac{1}{2}$ lb.,

$$\text{Volume of truss} = 3 \times 3 \times 1 = 9 \text{ cubic feet.}$$

$$\text{Therefore 9 cubic feet} = 57\tfrac{1}{2} \text{ lb.}$$

$$\text{Therefore 1 cubic foot} = \frac{57\frac{1}{2}}{9} \text{ lb.}$$

$$\text{Therefore 1 ton will contain } \frac{2,240}{1} \times \frac{9}{57\frac{1}{2}} \text{ cubic feet, } = \frac{2,240 \times 9 \times 2}{115} \text{ cubic feet}$$

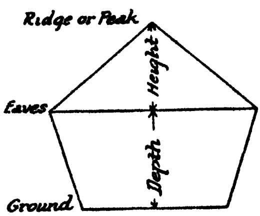
$$= 350 \cdot 6 \text{ cubic feet} = 351 \text{ to nearest cubic foot.}$$

Hay Stacks.

The capacity of all rectangular stacks may be calculated as for hay sheds. Where, however, the stacks are larger at the eaves than at the ground, and where the top ends slope inwards to the ridge, this method is not accurate and is therefore unsatisfactory. The better method is to apply the

prismoidal formula, which is only a little more difficult, is much more accurate, and has the big advantage that it can be applied to finding the capacity of all kinds of stacks (circular and rectangular), dams, tanks, and earth heaps.

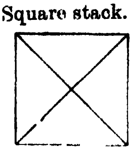
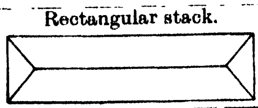
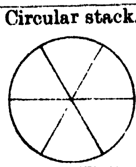
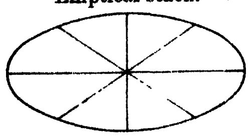
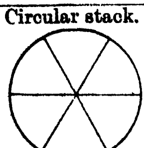
The formula, adapted to haystack problems, may be thus stated :—



<table>
<tr><td>Product of measurements at top ...
Product of measurements at eaves ...
Product of sums of corresponding measurements at top and eaves ...</td><td>Sum of the three products × height above eaves.</td><td rowspan="2">Sum × $\frac{1}{6}$ × constant = cubic content.</td></tr>
<tr><td>Product of measurements at eaves ...
Product of measurements at ground...
Product of sums of corresponding measurements at eaves and ground</td><td>Sum of the three products × depth below eaves.</td></tr>
</table>

The constants used depend upon the shape of the stack and what measurements are taken. They may be summarised thus :—

CONSTANTS for Prismoidal Formula.

Shape of Stack.	Measurements Used	Constant Multiplier
Square stack. 	Length of side at ground, eaves, and top; vertical height above eaves, and depth below eaves.	1
Rectangular stack. 	Length and breadth at ground, eaves, and top; vertical height above eaves, and depth below eaves.	
Circular stack. 	Diameter at ground, eaves, and top; vertical height above and depth below eaves.	$\frac{\pi}{4} = \frac{11}{14} = \cdot 7854$
Elliptical stack. 	Long and short diameters at ground, eaves, and top; vertical height above eaves and depth below eaves.	
Circular stack. 	Length right round stack at ground, eaves, and top; vertical height above and depth below eaves.	$\frac{7}{88}$

Thus it is seen that for rectangular or square stacks, when the length and breadth are the figures taken, the constant is 1; for circular or elliptical stacks when the diameters are taken, it is $\frac{\pi}{4}$ or the shown equivalents $\frac{11}{14}$ or ·7854; for circular stacks when the circumference is taken, it is $\frac{1}{4\pi} = \frac{7}{88}$.

A few worked examples will make the method clear. Applying the formula to the rectangular stack represented by Fig. 6, the volume would be :—

Product of length and breadth at top	$= 35 \times 0 = 0$	*Sum* × height above eaves $= 3{,}125 \times 10 = 31{,}250$	*Sum* $\times \frac{1}{6} = \frac{100{,}250}{6}$ $= 16{,}708\frac{1}{3}$ cub. ft.
Product of length and breadth at eaves	$= 45 \times 25 = 1{,}125$		
Product of sums of lengths and breadths	$= 80 \times 25 = 2{,}000$		
Product of length and breadth at eaves	$= 45 \times 25 = 1{,}125$	*Sum* × depth below eaves $= 5{,}750 \times 12 = 69{,}000$... ...	
Product of length and breadth at ground	$= 40 \times 20 = 800$		
Product of sums of lengths and breadths	$= 85 \times 45 = 3{,}825$		

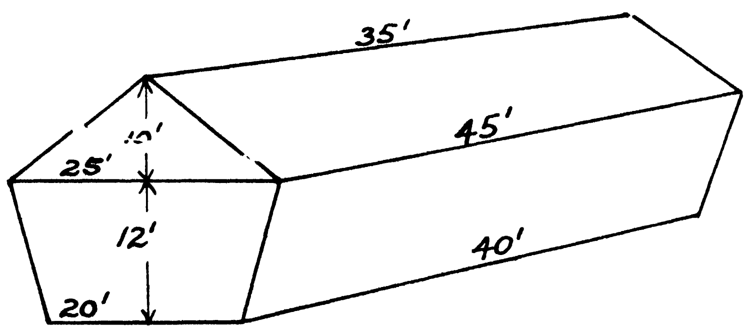


Fig. 6.—A Rectangular Haystack.

The rule is similarly applied to circular and elliptical stacks, bearing in mind the constant to be used. In the case of a circular stack where the diameter is the measurement taken, the constant $\frac{\pi}{4}$ must be used or the result would represent the volume of a square stack of which the side was equal to the diameter of the circular stack. Multiplying by $\frac{\pi}{4}$ reduces this volume to the correct amount for this shape of stack. Similarly if the constant $\frac{\pi}{4}$ were not used in the case of the elliptical stack the result obviously would be the volume of a rectangular stack having sides equal to the diameters of the elliptical stack. Again if the circumference of a circular stack be the measurement taken, the constant $\frac{1}{4\pi} = \frac{7}{88}$ must be used, or the result would represent the volume of a square stack with sides equal to the circumference of the round stack.

If the formula is applied to the circular stack represented by Fig. 7, using the circumference as the measurement, and the constant $\frac{7}{88}$, the volume would be :—

$$\left.\begin{array}{lrcl} \text{Product of measurements at top} & = 0 \times 0 & = & 0 \\ \text{Product of measurements at eaves} & = 96 \times 96 & = & 9{,}216 \\ \text{Product of sums of measurements} & = 96 \times 96 & = & 9{,}216 \end{array}\right\} \begin{array}{l} \textit{Sum} \times \text{height above} \\ \text{eaves} = 18{,}432 \times 9 \\ = 165{,}888 \quad \ldots \end{array}$$

$$\left.\begin{array}{lrcl} \text{Product of measurements at eaves} & = 96 \times 96 & = & 9{,}216 \\ \text{Product of measurements at ground} & = 84 \times 84 & = & 7{,}056 \\ \text{Product of sums of measurements} & = 180 \times 180 & = & 32{,}400 \end{array}\right\} \begin{array}{l} \textit{Sum} \times \text{depth below} \\ \text{eaves} = 48{,}672 \times 10 \\ = 486{,}720 \quad \ldots \end{array}$$

$$\textit{Sum} \times \tfrac{1}{6} \times \frac{1}{4\pi} = \frac{652{,}608}{6} \times \frac{7}{88} = 8{,}652 \text{ cub. ft.}$$

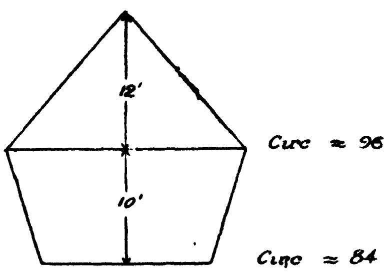


Fig. 7.—Diagram of a Round Haystack.

The volume of the conical top of a circular stack might easily be calculated by the ordinary rule for volume of a cone; but it is better to work as above, as this enables the one rule to be applied throughout.

The volume of an elliptical stack, having long and short diameters of 30 feet and 22 feet respectively at the eaves, and of 24 feet and 16 feet respectively at the ground, with height of 12 feet above the eaves and 10 feet from ground to eaves, would be :—

$$\left.\begin{array}{rcl} 0 \times 0 & = & 0 \\ 30 \times 22 & = & 660 \\ 30 \times 22 & = & 660 \end{array}\right\} \textit{Sum} \times \text{height above eaves} = 1{,}320 \times 12 = 15{,}840.$$

$$\left.\begin{array}{rcl} 30 \times 22 & = & 660 \\ 24 \times 16 & = & 384 \\ 54 \times 38 & = & 2{,}052 \end{array}\right\} \textit{Sum} \times \text{depth below eaves} = 3{,}096 \times 10 = 30{,}960.$$

$$\textit{Sum} \times \tfrac{1}{6} \times \frac{\pi}{4} = \frac{46{,}800}{6} \times \frac{11}{14} = 6{,}128 \text{ cubic feet.}$$

The prismoidal formula may be used to find the volume of the lower or upper half of the stack alone, or to find the capacity of a stone heap (Fig. 8), or a tank (Fig. 10.)

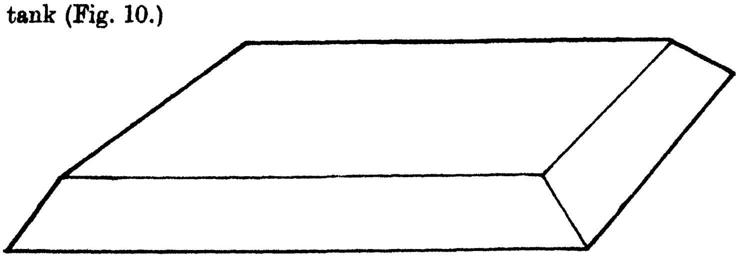


Fig. 8.—Diagram representing a Stone Heap.

Tanks and Dams.

In estimating the volume of water in a dam, care must be taken, where the dam is built on a slope, to take the top measurements along the line of water level. Generally, of course, this precaution is not necessary, for slopes are not usually so great as to appreciably affect the measurement. The question of dam capacity usually arises as soon as the construction of the dam is completed, and it is still dry, when the bottom measurements are readily taken, the capacity being required, not only for stock watering purposes, but for payment of the dam sinker. If the dam is full, and only the depth, and the slope of the sides are known, the bottom measurements can be calculated thus: "From the top measurements deduct the figure got by multiplying twice the depth by the horizontal component of the slope."

As an example, let the length and breadth at top of a dam be 120 feet and 90 feet respectively, the slope = 1 in 3, and the depth be 10 feet.

Then bottom length = $120 - (2 \times 10 \times 3) = 120 - 60 = 60$ feet.
Bottom breadth = $90 - (2 \times 10 \times 3) = 90 - 60 = 30$ feet.

It is seen from Figs. 9 (*a*) and 9 (*b*) that the sides will all "come in," a horizontal distance of 30 feet. Thus the bottom measurements are less at both ends, and both sides, than the top measurements by this amount, that is the distance to be subtracted from the top measurements is $(3 \times 10) \times 2 = 60$ feet.

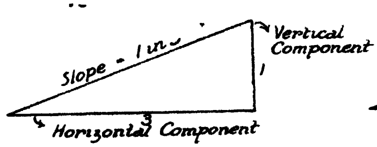


Fig. 9 (*a*).

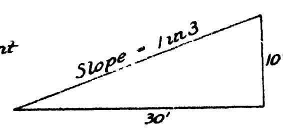


Fig. 9 (*b*).

The capacity of the tank illustrated in Fig. 10 would be found thus:—

Product of length and breadth at top	$= 150 \times 100 = 15{,}000$
Product of length and breadth at bottom	$= 114 \times 64 = 7{,}296$
Product of sums	$= 264 \times 164 = 43{,}296$

Sum $\times \frac{\text{depth}}{6} = 65{,}592 \times \frac{12}{6}$ cubic ft. $= 65{,}592 \times \frac{12}{6} \times \frac{1}{27}$ cubic yds. $= 4{,}859$ cubic yds.

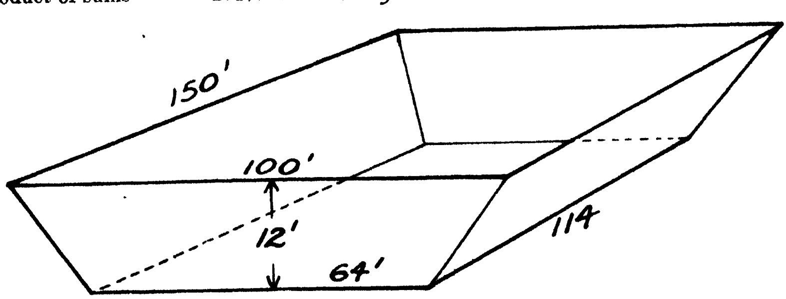


Fig. 10.—Diagram of a Tank or Dam.

The capacity of dams and tanks is always stated in cubic yards, and in the above example division by 27 converted cubic feet into cubic yards. The number of gallons of water can be found, because 1 cubic foot = $6\frac{1}{4}$ gallons. For example, in the above tank, 4,859 cubic yards = 4,859 $\times$ 27 cubic feet. Therefore the capacity of the tank = 4,859 $\times$ 27 $\times$ $6\frac{1}{4}$ gallons = 819,956 gallons.

The earth removed in the excavation of a tank will equal the water-holding capacity only when the surface is level. When the surface is very uneven, and the amount of earth removed is required with greater accuracy, the tank may be divided into a number of vertical strips by taking the measurements of several vertical and parallel cross sections, averaging the depths along and widths across the section. In old dams, the original shape may be lost and the top and bottom areas uneven and not parallel. They may be treated as suggested above, averaging depths and widths of a number of cross-sections. The number of points at which the depth or width is measured for purposes of averaging will depend upon the unevenness of the bottom, top, or sides. The average width will generally be got with sufficient accuracy by taking half the sum of the top and bottom widths (See Figs. 11 and 12).

The method of arrangement overleaf, where the figures representing "sums" are placed between the other two measurements, makes for neatness and reduces the number of rows of figures, but probably makes the matter a little more difficult to follow.

Calculating Size of a Dam.

An important problem confronting the dam-sinker is to find the length and breadth he shall make his dam to give him the desired capacity. He usually can decide upon the number of cubic yards and the depth desired, but is then in doubt as to what length and breadth the dam must be made. To arrive at these measurements, the slope of the sides must be known. For example, suppose the top measurements are required for a tank of 5,000 cubic yards capacity, 12 feet deep, with a slope of 1 in 3. The proceedure is as follows:—

(i) Find the number of cubic yards in an average section of the dam 1 yard deep. To do this divide the total capacity in cubic yards by the depth in yards. In this example—

Capacity of dam = 5,000 cubic yards.

Capacity of average section $= \frac{5{,}000}{4}$ cubic yards = 1 250 cubic yards.

(ii) Take any two numbers which multiplied together, give this number—1,250 in the example. These two numbers (50 and 25) then represent the length and breadth in yards of the average section (50 $\times$ 25 = 1,250). In a dam with sloping sides, the average section is assumed to be half-way

METHOD of calculating quantities by means of cross-sections :—

Breadth and depth of No. 1 Section are 57′ and 0′, then...	$57 \times 0 = 0$	
Sums of breadths and depths of Nos. 1 and 2 Sections	$= 104 \times 5 = 520$	*Sum* × distance between Sections Nos. 1 and 2 $= 755 \times 16 = 12,080$ ...
Breadth and depth of No. 2 Section are 47′ and 5′, then	$47 \times 5 = 235$	
Sums of breadths and depths of Nos. 2 and 3 Sections	$= 93 \times 9 = 837$	*Sum* × distance between Sections Nos. 2 and 3 $= 1256 \times 30 = 37,680$.
Breadth and depth of No. 3 Section are 46′ and 4′, then	$46 \times 4 = 184$	
Sums of breadths and depths of Nos. 3 and 4 Sections	$= 91 \times 9{\cdot}3 = 846$	*Sum* × distance between Sections Nos. 3 and 4 $= 1268 \times 46 = 58\ 328$..
Breadth and depth of No. 4 Section are 45′ and 5·3′, then	$45 \times 5{\cdot}3 = 238$	
Sums of breadths and depths of Nos. 4 and 5 Sections	$= 89 \times 14 = 1246$	*Sum* × distance between Sections Nos. 4 and 5 $= 1867 \times 40 = 74\ 680$.
Breadth and depth of No. 5 Section are 44′ and 8·7′, then	$44 \times 8{\cdot}7 = 383$	
Sums of breadths and depths of Nos. 5 and 6 Sections	$101 \times 8{\cdot}7 = 879$	*Sum* × distance between Sections Nos. 5 and 6 $= 1,262 \times 18 = 22,716$
Breadth and depth of No. 6 Section are 57′ and 0′, then	$57 \times 0 = 0$	

$$Sum \times \tfrac{1}{6} \times \tfrac{1}{27} = \frac{205,484}{6 \times 27} = 1,268 \text{ cubic yards.}$$

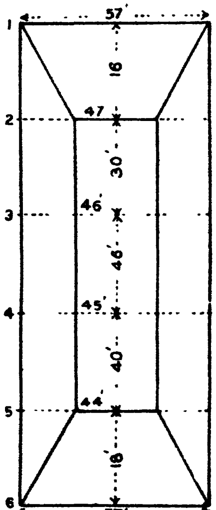


Fig. 11.—Tank. Sketch plan overall.

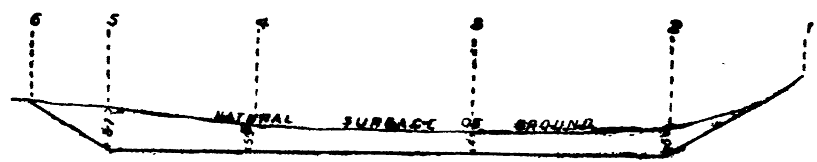


Fig. 12.—Average Longitudinal Section of Tank of Irregular Depth.

between the surface and the bottom of the dam. The measurements 50 × 25 would correspond to the length and breadth of this section, midway between the top and bottom of the dam (Fig. 13).

(iii) Add to the mid-measurements an amount equal to the depth multiplied by the "slope figure," *i.e.*, the horizontal component of the slope. A consideration of Fig. 14 shows that to get the top measurements in this case; add to the mid-measurements, 6 yards for each end. Thus—

Top length = 50 + (4 × 3) = 62 yards = 50 + (6 + 6) = 62 yards.
Top breadth = 25 + (4 × 3) = 37 yards.

Thus the top measurement = 62 yards long by 37 yards. These measurements would be checked as shown in the next example.

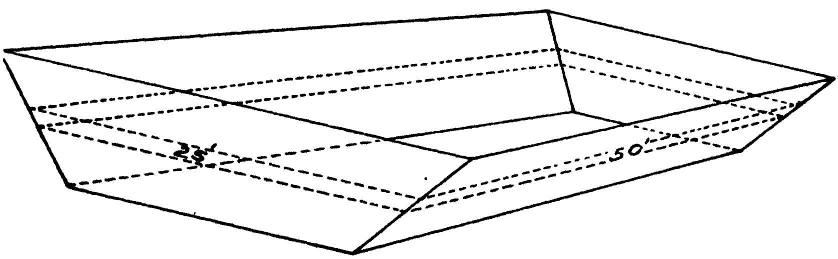


Fig. 13.—Diagram of Tank, showing Average Section.

The top measurements of a tank having a capacity of 6,000 cubic yards, a depth of 15 feet, and a slope of 1 in 2, would be ascertained as follows :—

Average section = $\frac{6,000}{5}$ = 1,200 cubic yards.

Mid-measurements, say, 40 × 30 (= 1,200 cubic yards).
Add to each end, depth × slope figure = depth × 2.
Then top measurements = 40 + (5 × 2) and 30 + (5 × 2)
= 50 yards × 40 yards.

It is possible to check these measurements by finding the bottom measurements and then calculating the capacity of the dam. To get bottom measurements :—

Mid-measurement = 50 × 40
Subtract depth × 2 in each case,
Then bottom measurements = 40 — (5 × 2) and 30 — (5 × 2) = 30 × 20.

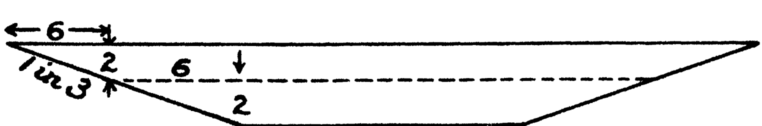


Fig. 14.—Longitudinal Section of a Tank.

From these measurements the capacity of the tank would be—

$$\left.\begin{array}{rcl} 50 \times 40 &=& 2{,}000 \\ 30 \times 20 &=& 600 \\ 80 \times 60 &=& 4{,}800 \end{array}\right\} Sum \times \frac{\text{depth}}{6} = \frac{7{,}400 \times 5}{6} = 6{,}166\tfrac{2}{3} \text{ cubic yards}$$

which is too much. There will always be a slight excess capacity given from measurements obtained as above.

By cutting down the length, say 1 yard, the volume would be :—

$$\left.\begin{array}{rcl} 49 \times 40 &=& 1{,}960 \\ 29 \times 20 &=& 580 \\ 78 \times 60 &=& 4{,}680 \end{array}\right\} Sum \times \frac{\text{depth}}{6} = \frac{7{,}220 \times 5}{6} = \frac{36{,}100}{6}$$
$$= 6{,}016\tfrac{2}{3} \text{ cubic yards.}$$

The top measurements, 49 yards by 40 yards, give a capacity of 6,016⅔ cubic yards, which might be taken as near enough, considering the irregularities of surface, bottom, and sides.

INFECTIOUS DISEASES REPORTED IN JULY.

THE following outbreaks of the more important infectious diseases were reported during the month of July, 1928 :—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	11
Piroplasmosis (tick fever)	Nil.
Blackleg	5
Swine fever	1

—MAX HENRY, Chief Veterinary Surgeon.

GRAIN CO-OPERATIVES IN U.S.A.

WHEAT, corn, oats, rye, barley, flax, and other grains to the amount of one-half billion bushels were marketed during the 1926-27 season through the 3,330 farmers' elevator associations listed by the United States Department of Agriculture. This grain had a sales value of approximately 450,000,000 dols. The quantities handled were estimated as follows :—Wheat, 213,000,000 bushels; corn, 152,500,000 bushels; oats, 98,500,000 bushels; barley, 16,500,000 bushels; flax, 9,000,000 bushels; rye, 8,500,000 bushels; other grains, 2,000,000 bushels.

AUSTRALIAN IMPORTS OF AGRICULTURAL MACHINERY.

FOR the year ended 30th June, 1928, Australia imported agricultural machinery to the value of £691,078. The figures for the three previous years and the principal countries supplying the imported goods are shown hereunder :—

	From Canada.	From U.S.A.	From Great Britain.	Total Imports.
	£	£	£	£
1924–25	387,205	280,886	109,492	784,024
1925–26	376,502	262,322	116,323	761,766
1926–27	361,591	252,050	100,006	722,094

Care of Rennet at the Factory.

A. B. SHELTON, Senior Dairy Instructor.

FREQUENTLY it is noted that some cheese-makers fail to pay attention to the protection of their rennet supplies at the factory against contamination. In such cases it is perhaps not realised that impure and weakened rennet extract can take an active part in retarding their efforts to manufacture "choice grade" cheese, even when the milk and other conditions are satisfactory.

Rennet, as commercially prepared to-day for use in the manufacture of cheese, is a very carefully adjusted chemical solution containing the all-essential enzyme, which has been extracted from selected vells taken from suckling calves. Although the preparation of the extracted solution is to some extent a trade secret held by those financially interested in the commercial preparation of rennet, it can be readily understood by the cheese-maker that it is impossible for the manufacturer to render the rennet extract sterile, owing to the delicate nature of the enzyme and the danger of its milk-coagulating properties being impaired if sterilising agents, in the form of heat or strong preservatives, are made use of. Nevertheless, by the application of scientific knowledge of the biological and chemical factors, commercial rennet is to-day prepared and sold, having a high standard of purity and uniform strength. It then lies with the cheese-maker to do all in his power to maintain the purity and strength of the rennet while held for subsequent use at his factory.

Standard brands of rennet are always sold to the user in carefully-prepared and sealed containers, such as bottles, jars, and casks. Bottles and jars are carefully cleansed and sterilised before use, and casks are in addition sprayed inside with hot paraffin wax, which prevents subsequent contamination of the rennet while in the sealed containers. Thus, those brands of rennet extract from either Australian or overseas sources, which have proved their merit, can be considered as safe up to the time of opening the countainer for use, for, providing they have been kept free from exposure to heat or direct sunlight, the only change the rennet should undergo is a very slight tendency to weaken in strength, due to age, which may amount to a 2 per cent. depreciation in strength in six months from preparation. For this reason it is not advisable to take delivery of supplies of rennet which will take more than, say, three months to utilise. It is essential, however, that as soon as a container is opened for drawing off the quantities of rennet required daily, the container should be kept in a cool room with a clean atmosphere, particularly in the case of casks where a tap has to be inserted in addition to an air-hole to allow the entrance of air to replace the liquid drawn off. In this case a hole is bored near the bottom of the cask for insertion of the tap, and a small air-hole is bored at the top of the cask, in which hole a wooden plug is placed so that it can be withdrawn when the tap is used, and replaced immediately. The most convenient type of tap

is that used in wine casks, and it should be made entirely of wood, for if the rennet extract is left in contact with metal it may cause corrosion, which will induce changes in the chemical constituents of the solution and have an injurious effect.

The main factors which the cheese-maker should bear in mind are as follows:—

1. That the rennet enzyme is of a delicate nature. It is subject to depreciation in strength if exposed to heat or direct sunlight.
2. That the rennet extract solution, if subject to contamination at any time, may quickly develop yeast and mould fermentations, such as become evident when it develops a cloudy appearance and fruity smell, and in such condition may easily be a cause of fruity flavour and open body in cheese.
3. That the strength of the rennet is impaired by alkaline substances, hence it is advisable to guard against bringing the rennet extract into contact with any substance which may cause alkaline action. In this regard also it is necessary to remember that annatto colouring matter is prepared in a strong alkaline solution, and it is essential to remove all traces of colouring matter from vessels or measuring glasses used in measuring or adding rennet to the milk vat.

The influence of rennet is a vital factor in the proper control of coagulation and contraction of the curd in cheese-making, and is worthy of every attention to prevent any undesirable deterioration in its strength or purity.

Limited Role of Capillary Soil Moisture.

Observations made with special soil cylinders at Rothamsted Experimental Station (England), extending over the great drought of 1921, show that water some 2 or 3 feet below the surface can only reach the surface exceedingly slowly. The capillary movement of water is therefore very small and plant roots cannot obtain much water by this means.—B. A. Keen, in *Proc. First Internat. Congress Soil Sci.*, Washington, D.C., 1927.

Soil Erosion: A National Menace.

Not less than 126,000,000,000 pounds of plant food material is removed from the fields and pastures of the United States every year. Most of this loss is from cultivated and abandoned fields an over-grazed pastures and ranges. The value of the plant food elements (considering only phosphorus, potash, and nitrogen) in this waste, as estimated on the basis of the chemical analyses of 389 samples of surface soil collected throughout the United States, and the recent selling prices of the cheapest forms of fertiliser materials containing these plant nutrients, exceeds 2,000,000,000 dollars annually. Of this amount there is evidence to indicate that at least 200,000,000 dollars can be charged up as a tangible yearly loss to the farmers of the nation. These calculations do not take into account the losses of lime, magnesia, and sulphur.—H. H. Bennett. Bureau of Chemistry and Soils, U.S.A. Department of Agriculture.

Painting on the Farm.

(Concluded from page 631.)

N. L. JONES, Supervising Architect.

Preparing Surfaces for Painting.

To prepare the surfaces for painting is more important than is generally supposed. Good paint and also good intentions can and probably will be destroyed if this section of the painter's work is not given the attention it calls for. Therefore, it is proposed to deal fully with this subject.

Generally, the surface should be smooth and clean. This latter word is comprehensive in its application, as any surface with a film of dust, moisture, smoke stain, or any matter foreign to the paint or the material to be painted is not clean. To make surfaces smooth calls for either the removal of excrescences or the filling of voids, and each of the following will have its special use:—Sandpaper (fine and middle 2), steel wool No. 2, patent pumice stone, and also a putty knife. An artisan's equipment would include a blow lamp for the removal of cracked or peeling paint, etc. The risk of fire, however, might make this dangerous in the hands of an amateur if used on a weatherboard structure. For this reason it will probably be better to use a patent liquid paint solvent for the removal of cracked paint. It is essential that the solvent be entirely cleaned off with benzine or methylated spirit before applying new paint.

Knots and veins that exude gum should be smoothed off and given a coat of shellac or patent knotting. Holes should be stopped with putty (this consists of whiting and linseed oil), but not until the priming coat has been applied.

Moisture is one of the greatest destroyers of paint. It may be in the timber (unseasoned timber) or on the surface in the form of condensation, in which case it may contain sulphur, particularly in kitchens where gas fumes from the stove condense upon cold surfaces and deposit sulphur, which is a great destroyer of white-lead paint.

Tacky paint can be successfully prepared for painting by coating it with lime-water (not limewash). The water in which lime has been slaked will, if allowed to stand for some time, become quite clear. It is this clear water that should be used.

Smoky ceilings and walls should, if extremely dirty, be first washed with water and soda. If in fair condition a coat of lime-water will suffice. Rub down between each coat of paint to remove excrescences. Remove dirt from corners, quirks of mouldings, etc., with putty knife, and always use the dusting brush well in advance of the painting.

The Painting of Various Materials.

Timber.—Previous references to painting and how to mix paints apply principally to the painting of timber; it is therefore not necessary to deal with this material further.

Cement.—It would be quite wrong to apply the paint previously referred to, or any paint ordinarily used for house painting, to new cement, for new cement contains an alkali which will cause the paint to lie on the surface in a treacle-like form, *i.e.*, it will not dry, but always remains in a wet, sticky condition.

Untreated cement work should not be painted until it is about two years old except with cold water paint, limewash, or one of the proprietary lines of paint specially manufactured for the purpose. If desired it can be prepared for ordinary paint by applying two coats of sulphate of zinc. When dry the surface should be brushed down to remove all crystals, it may then be painted in the ordinary way. A very satisfactory priming coat for weathered cement work may be had by mixing one part of red lead with two parts titanium zinc paste.

Asbestos Cement Sheets.—The foregoing references to cement apply more or less to asbestos cement sheets, for they are principally of cement, and although containing considerably less free lime, it is inadvisable to paint them when new with ordinary paint without special treatment. It is advisable to allow the sheets to weather for about twelve months and then apply a coat of equal parts of genuine turpentine and hard oak varnish. If to this a coat of paint is applied consisting of one part of red lead to three parts of titanium zinc, a first-class foundation will be provided for further painting.

For internal surfaces a coat of preparatory liquid will prepare them for one or two coats of cold water paint, or the even more pleasing flat oil paint, so many beautiful shades of which are now available. Cold water paint may be applied externally in lieu of oil paint if desired. For this purpose it will be necessary to add about one quarter of a pint of raw linseed oil to the gallon of water paint.

For ceilings kalsomine is recommended in lieu of cold water paint. It often happen that repeated applications of this latter material will cause it to crack and peel off in a most unsatisfactory manner. This cracking does not occur on the walls to anything like the same extent.

Galvanised Iron.—Under the heading of iron may be included roof iron, guttering, downpipes, tanks, and water pipes. In all these instances the iron is galvanised to prevent it rusting, so that to some extent painting is only necessary after the galvanising shows signs of wear. Guttering, downpipes, etc., are usually painted for appearance immediately the building is completed, being given one good coat only, but it is preferable not to paint roof iron until it has been exposed to the weather for a few years. Because of the continual contraction and expansion, the extremes of heat and cold, and the absence of a good grip or key, ordinary house paint is not

suitable, and it is always advisable to use a high-grade paint specially manufactured for the purpose. The writer has not yet found a so-called cheap roof paint that is satisfactory.

Whitewash.

The question is often asked how to make a suitable whitewash, so that probably a few remarks here will not be out of place.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle," a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

The Better Farming Train.

The following is the itinerary for the next tour of the Better Farming Train:—

September 20—Lockhart.
,, 21—Oaklands.
,, 22—Urana.
,, 24—Corowa.
,, 25—Brocklesby.
,, 26—Walla Walla.
,, 27—Holbrook.
,, 28—Henty.
,, 29—Tumbarumba.

October 1—Tarcutta.
,, 2—Bethungra.
,, 4—Queanbeyan.
,, 5—Michelago.
,, 6—Bombala.
,, 8—Cooma.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.
Forbes (K. O. Anderson) ..	.. Sept.	4, 5
Corowa (H. G. Norton) ..	.. ,,	4, 5
West Wyalong (A. Andrew)	.. ,,	4, 5
Young (T. A. Tester) ..	.. ,,	5, 6
Holbrook	.. ,,	6, 7
Cowra (E. P. Todhunter)	.. ,,	11, 12
Ganmain (C. C. Henderson)	.. ,,	11, 12
Manildra	.. ,,	11, 12
Albury	.. ,,	11, 12, 13
Barmedman (S. S. Pembethy) ..	,,	12
Gosford (J. S. Gardiner) ..	.. ,,	14, 15
Canowindra (W. E. Frost)	.. ,,	18, 19
Murrumburrah (W. Worner)	.. ,,	18, 19
Temora (A. D. Ness) ..	.. ,,	18, 19, 20
Boorowa (W. Thompson) ..	.. Sept.	20, 21
Melbourne Royal ..	,,	20 to 29
Barellan	.. ,,	26
Singleton	.. ,,	26 to 28
Hillston (S. Peevers) ..	,,	28
Ardlethan	Oct.	3
Quandialla (V. Talbot) .	.. ,,	3
Walbundrie (H. G. Collins)	.. ,,	3
Narrandera (J. D. Newth)	.. ,,	9, 10
Ariah Park (Mort Collings)	.. ,,	10
Bribaree (Jesse Austin) ..	.. ,,	10
Griffith (W. Sellin).. ..	.. ,,	16, 17
Deniliquin (P. Fagan) ..	.. ,,	16, 17
Cootamundra (R. D. Beaver) ..	,,	23, 24

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Potatoes—	
Brownells	J. B. Howell, Glen Innes.
Carman	Johns Brothers, Strathalbyn, Myrtleville.
	M. Hoare, Myrtleville.
Early Manistee	J. J. Cusack, Stonequarry, Taralga.
Factor	R. E. Ball, Stonequarry, Taralga.
	E. McAlister, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
	N. C. Peters, Pinnacle Road, Orange.
Great Scott	J. B. Howell, Glen Innes
Langworthy	N C. Peters, Pinnacle Road, Orange.
Satisfaction	J. J. Maloney senior, Stonequarry, Taralga.
	M. Hoare, Myrtleville, Taralga.
	C. N. Hillen, Taralga.
Scott's Satisfaction	J. B Howell, Glen Innes.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Sunnybrook Earliana ...	A. E. Johnson, Green Valley, via Liverpool.
Broom Millet	Manager, Experiment Farm, Coonamble.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Maize—	
Wellingrove	Manager, Experiment Farm, Glen Innes.
Grasses—	
Sudan Grass	Under Secretary, Department of Agriculture.
	Manager, Experiment Farm, Nyngan.
	Manager, Experiment Farm, Coonamble.
	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Trangie.
	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
White African	Under Secretary, Department of Agriculture,
Saccaline	Manager, Experiment Farm, Lismore.
	D. P. Shearer and Sons, Glendon, Scott's Flat, Singleton.
Collier	Manager, Experiment Farm, Grafton.
Cowper (late Selection No. 61)	Manager, Experiment Farm, Grafton.
Grain Sorghums—	
Feterita	Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

SEPTEMBER.

E. HADLINGTON, Poultry Expert.

THROUGHOUT this month the packing of eggs for export should be in full swing, and poultry farmers can do much to assist exporters, not only in keeping up the standard of quality, but in the direction of reducing the cost of packing, which is in the interests of all concerned.

One has only to visit the floors where eggs are being packed for export or, for that matter, local storage, to see how much could be done by the farmer to facilitate the handling of the eggs. That there is much room for closer co-operation between producer and exporter would be apparent from a study of export packing. For instance, to stand on an agent's floor and see case after case of eggs opened in which small, dirty, faulty shelled, too large, and even very stale eggs are mixed, and note the time it takes to repack them compared with other cases which contain good, clean, and evenly graded eggs, would convince anyone of the importance and wisdom of a little extra care during the short period of export.

There are many poultry farmers who feel that they do not know what is required in packing, whilst others are apt to take the view that their few cases of eggs will not make much difference, and therefore do not take the trouble they should to ensure that the eggs unsuitable for export are kept separate from those that are up to the required standard. There is no escape from the fact that there are far too many eggs sent into market in an undesirable condition even for local consumption, but where eggs have to be stored for long periods, as in the case of local cold storing and export, even greater care is necessary, and much could be done to effect improvement.

Hints on Packing.

Grading.—One of the first considerations with regard to eggs marketed during the export season is a correct knowledge of grading, and as there were two grades exported last season there is likely to be some confusion on this point, but so that there will be no doubt as to what is required the particulars are here given. The grade for export this season will be an average of 2 ounces or over, with a minimum of 1⅞ ounces for any egg.

This means that all eggs under 1⅞ ounces will be rejected from those packed for export. In this connection, consignors sending their eggs to agents who are exporting could facilitate operations by packing at least a proportion of the eggs that may be suitable for export, and mark the cases to distinguish them from those for local market.

Packing.—In packing eggs intended for export it is most essential that only fresh eggs be put in, preferably not more than three days old. In fact, all eggs should be marketed twice a week so that reasonable freshness is

assured. All abnormal eggs, such as those with malformed, thin, or obviously porous shells should be omitted, also those that are at all soiled.

Eggs that have been washed must on no account be included, and any extra large or unduly elongated ones should be rejected.

Only clean cases, fillers, and flats should be used, and care is necessary in packing to minimise the risk of breakages whilst in transit. To assist in this direction it is a good plan to place in the bottom of the cases a pad of crumpled paper or, better still, a pad of wood wool evenly spread over the bottom. On this the flat is placed, and if there is too much space between the sides of the case and the fillers, or at the ends, a crumpled piece of paper placed between will keep the fillers from moving. On top, another pad similar to that in the bottom is required, but these pads should not be so thick as to cause undue pressure when the lid is put on.

Washed Eggs.—During the export season it is highly desirable that all eggs that have been washed be packed so that they will only be used for local consumption, and for this reason it is a good idea to mark cases containing washed eggs, "local" or "washed." This does not mean that they would be sold as second grade, but only that they need not be handled for export packing.

Keep Eggs Clean.

The problem of keeping eggs clean during showery weather, such as has been experienced of late, is a difficult one, but where semi-intensive houses are in use the trouble can be overcome to a certain extent by having concrete floors, keeping plenty of clean scratching litter in the houses, and while the ground is muddy confining the birds until the majority have laid. Collecting the eggs twice a day will also save many eggs from becoming soiled. In ordinary fine weather a little care in keeping the nests clean, and seeing that there is plenty of nesting accommodation will help considerably in this matter.

During the flush season of laying it is advisable to allow at least one nest to each five birds. One of the best classes of nests can be made by cutting one side out of a kerosene tin, the nests being placed side by side, or end to end, in a rack along the side of the house with the open sides upwards. These can be nearly half filled with clean coarse sand, shell grit, or straw.

The importance of keeping eggs clean should not be regarded lightly, because the shell of the egg is porous, and when washing becomes necessary any water penetrating the shell may lead to infection by fungi or bacteria of the various classes that attack eggs. For this reason it is advisable in the case of slightly soiled eggs merely to wipe them over with a clean damp cloth, which should be frequently rinsed in clean water.

Washing Eggs for Local Market.

Where washing becomes necessary the eggs should not be soaked for any length of time, or be left in the water whilst being washed. One of the best methods to adopt in washing eggs is to have a frame with a wire bottom

similar to a sieve, in which the eggs are placed. This can either be put into a vessel of water for a few seconds, or water can be poured over them. The washing can then be done in clean water to which has been added a teaspoonful of washing soda to each gallon. This will assist in removing the dirt and act as a mild germicide. Where the dirt is not easily removed a cloth dipped in clean sand will make the task easier. As the eggs are washed they can be placed upon a wire tray to drain, and when finished any surplus moisture should be wiped off with a cloth.

Storing Eggs on the Farm.

The conditions under which eggs are kept on the farm prior to marketing have a material bearing upon their subsequent quality. Therefore, a little care in this respect helps towards placing eggs on the market in the best possible condition, which should be the aim of every poultry farmer, and having done this it remains for those handling the eggs in the various channels through which they pass before reaching the consumer to follow up the producers' efforts by similar careful methods.

The room in which the eggs are kept should be free from mouldy or musty odours, and, while allowing sufficient ventilation, must not be too draughty. The temperature of the room is another important matter, especially in the hot weather when the eggs should be kept as cool as possible. Where a cool room is not available the best course to take is to pack the previous day's eggs early the next morning, and, after packing, cover the cases over until they are sent to market.

On no account should eggs be allowed to stand exposed to the air during the warm weather, as this leads to rapid evaporation, and results in eggs being rejected as stale.

Egg Marketing Board.

The day fixed for the poll under the Marketing of Primary Products Act on the question of constituting an Egg Marketing Board within the counties of Cumberland and Northumberland, and the shires of Nattai and Wollondilly, is Saturday, 21st September, 1928. Every poultry farmer whose name is included in the official roll will have a ballot paper posted to him with an addressed envelope for its return to the Director of Marketing, Department of Agriculture, Sydney, who is the returning officer. Ballot papers will be issued in sufficient time to allow of their return by the closing date—21st September.

Voting at the poll is compulsory, and failure to vote may entail a fine not exceeding two pounds. In view of the importance to the industry of the question at issue, there should be a general desire to participate in the poll, but if there be indifferent electors it is well that they should appreciate the importance of casting a vote.

Orchard Notes.

SEPTEMBER.

C. G. SAVAGE, W. LE GAY BRERETON AND R. J. BENTON.

Cultivation.

IN September, periods generally occur that remind one that the long drying days of summer are at hand, and that one must be prepared for the work involved in checking the loss of soil moisture. Loss of moisture occurs in two ways (through weeds or by direct evaporation), and the orchardist's best weapon of defence is a mulch in some form or other. The most universal and practical mulch for orchards at the present day is the dry soil mulch, maintained by keeping the surface of the soil stirred.

In previous issues of these "Notes," instructions were given in regard to winter ploughing. The form of implement to use, and the exact time to start the summer cultivation depends again on circumstances. In some cases the soil might have remained in a good loose condition with only a very thin "egg-shell" crust over the surface, and with little or no weed growth since the last ploughing. In such cases cultivation can economically be delayed, although a watch must be kept, and once the small seedling weeds develop and start to send their roots down they must be checked. For this work a good tine cultivator is sufficient and gets over the ground speedily. If a heavy crop, either volunteer or sown, has been ploughed under during the winter and has not completely rotted, then a disc cultivator is necessary to carry out the work, and at same time to avoid bringing the partially decayed green manure to the surface.

If, as sometimes occurs, especially in our tableland districts, the soil has been compacted since the last ploughing, either by the action of rain or the tramping down of the soil during spraying, late pruning, or other operations, then it will be necessary to use a plough in place of a cultivator.

From the spring onward through the major part of the summer it is necessary to maintain a dry soil mulch of about 3 inches. As the mulch needs to be re-formed as quickly as possible when the land has become dry enough to work after rain, implements such as cultivators, which cover the ground quickly, are necessary, though the plough makes the most lasting mulch.

Codlin Moth.

Apple and pear growers are again reminded that the whole of the codlin moth trouble arises from the carry-over grubs from the previous season. A female moth may lay sixty eggs, so that every carry-over grub killed means considerable saving.

The examination of apple, pear, and quince trees for carry-over grubs should have been completed before this month as a safeguard against the early emergence of the moths. But if this work has not been completed it should be pushed on with as rapidly as possible.

In the journal *Better Fruit*, Oregon, U.S.A., for May, 1928, there is an account of an experiment with codlin moth bandages made of various materials, carried out by Ralph H. Smith of the University of California. These experiments have not yet been completed, but the indication is that a closely woven material, or a jute bandage covered with black building paper which excludes the light, is more effective than a loosely woven material which the light penetrates easily.

The infestation of moth last season was particularly light in most districts and there is a danger that some growers will forget past ravages and slacken off in their moth control operations. This should be guarded against for there is nothing surer than, if control methods are slackened, that the moth will very soon gain the upper hand.

Aphides.

Spraying for green peach aphis and black cherry aphis with oil should have been carried out as directed in previous "Notes," but a close watch should be kept on the trees and a thorough application of nicotine sulphate or tobacco wash given, should this pest appear.

A close watch should also be kept for black peach aphis, which was also mentioned previously, and applications of a nicotine spray given at the first sign of its appearance.

When applying nicotine sulphate or tobacco wash for control of any of the above aphides it is necessary to use a high pressure—nothing under 150 lb., and better results will be obtained from a pressure of 250 lb. A drenching spray must be given, and this is most easily done with a gun or pistol, but if only the ordinary nozzle is available it should be held close to all affected parts so that the clusters of insects are hit by the solid jet of spray soon after it leaves the nozzle, and before it breaks into a fine mist.

The trees should be examined two days after completion of spraying, and if any live aphides are present the operation should be repeated. The aphides breed very fast, and if a longer period elapses between applications of spray they will breed up as fast as they are killed, and no headway is made as far as control is concerned.

As stated in previous "Notes," the most effective treatment for the black cherry aphis and green peach aphis is the oil spray applied before the trees break into leaf in the spring.

Leaflets dealing with the above pests and with the making of tobacco wash are obtainable free from the Department of Agriculture.

Grafting Wax.

Last month recipes for making grafting wax were given. A further recipe has been tried out by Mr. Walker, orchardist, Glen Innes Experiment Farm. It is as follows:—Resin 5 lb., beeswax 1 lb., linseed oil ¼ pint, lampblack ½ lb. Mr. Walker considers this grafting wax is the most satisfactory he has ever used. He tried it without the lampblack, but it was then too hard and chipped off; the reason for this probably being that the black colour due to the lampblack absorbs more heat, which keeps the wax softer. It is also probable that the greater heat absorbed is beneficial to the callousing of the scion and stock.

A Grafting Putty.

Mr. E. J. Lindsay, Orchard Inspector, Armidale, uses a putty made from the best English whiting and castor oil instead of grafting wax. Sufficient putty to cover about seventy grafts on, say, seven-year old apples would take 8 lb. of whiting and 1½ pints of oil. It should be mixed rather on the dry side several days before it is used, and placed in a can of water, which makes it more plastic, and in which it can be kept for any length of time. Putty can be specially recommended where trees have been attacked by woolly aphis—the aphis will not attack cuts so covered. Putty can be made with linseed oil, but draught castor oil is better, as the putty thus made remains soft for a longer time and does not set so hard.

A fairly thick coating of putty is placed over the whole of the work, and worked down over the tie all round the stock so that all cuts are completely covered. The fingers should be dipped in water and the whole smoothed over, and the putty worked well around the base of the scion. Finally, cover the putty with strips of old cloth or paper.

Tree Recording Chart.

The harvesting of citrus fruits is at present occupying much time, particularly as the Late Valencia variety is still reaching maturity. Pending a start with the harvesting of this variety it is opportune to suggest that a system of recording each tree's performance should be instituted. A chart by means of which four years' yield performances of each tree in the orchard can be seen at a glance is displayed on the Better Farming Train, and growers who studied that chart will do well to adopt the suggestion, as the keeping of tree records is most important, and will amply repay the little time occupied in compiling them. Not only will such a chart show which trees are the best yielders over a given period, but may suggest a cause as to why there is such a difference, which is very important. In every branch of a business the unprofitable and barely profitable operations must be known definitely, and unless such a system is instituted with citrus production many trees may be cultivated perpetually at a loss.

The suggested simple chart is made by ruling a large sheet of paper into squares. Each intersection of the lines, *i.e.*, the corners of the squares, represents a fruit tree. The squares should then be ruled into smaller squares by lines (perpendicular and horizontal) running through the centres of the original squares. Thus, around each corner of the original squares—each corner represents a tree—are four small squares. An inspection of the trees to be recorded just prior to commencing the harvest will suggest an estimated yield, which should be placed in one of the small squares around the tree represented. The corresponding square for the next tree should be filled in likewise, and so on. In the second year another square is filled in around each tree, so that eventually four years' performances are seen at a glance.

Besides being an indicator as to which are the most productive trees, the information will usually convey suggestions for improving the unprofitable trees, possibly by using increased amounts of fertilisers, attending to drainage troubles, or re-working over to better types.

The registration of the Co-operative Bud Selection Society Limited. has enabled bud selection work to continue along a definite line of progress. It is fairly certain that a number of variations may prove of value. A desirable type of Valencia which has most of the characteristics of the Navel is being constantly sought. A rudimentary Navel in the skin of the Valencia is not sufficient. This is often found. A pronounced Navel marking with the secondary orange well defined, combined with apparent seedlessness, whilst retaining plenty of juice, are some of the characteristics desired. Growers are asked to report any variations of such type noted when harvesting their Valencias, and they should not pick the fruit until the twig is marked.

Exanthema.

Affected trees and those which have not responded to the usual methods recommended for this malady (drainage, increasing the supply of organic matter, etc.) should be sprayed with Bordeaux mixture (6–4–80), adding 1 per cent. (1½ quarts) of emulsified red oil. Such should be applied to the trees at once. Experiments are being continued by the Biological Branch as to the value of even later sprayings. Applications of 2 lb. of copper sulphate (bluestone) to the soil have also given good results in some instances even when applied later than the sprayings. In applying bluestone to the soil care should be taken that the bluestone is not very lumpy, or that the application is not very uneven, as individual root injury may result.

Pruning Citrus Trees.

This work may be done where required. In young citrus trees very little, if any, pruning is recommended beyond cutting clean out any strong shoots which threaten to rob the tree and displace limbs in better situated parts. Generally speaking, all strong shoots arising within an imaginary circle of about 1 foot diameter (taking the trunk as centre) should be suppressed,

and frequent attention paid to see that they remain so. Citrus trees in full bearing only require the dead wood removed and very low hanging branches shortened to more upright growths.

In districts where "Dicky Rice" are prevalent, low hanging limbs should be pruned to a height of at least 9 inches from the ground to prevent the insects climbing into the tree by other means than the stem. A sticky preparation applied to the tree trunks will usually minimise and largely prevent disfigurement by such insects.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1928 —

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits .	895,399	175,995
,, Tomatoes..	75,524	...
	doz.	doz.
,, Melons ...	...	64
	lb.	lb.
Canned Fruits ..	57,988	1,736
Dried Fruits—		
Unspecified ...	21,784	728
Currants ..	8,790	308
Raisins ..	7,706	448
Sultanas ..	.	...
Apricots ...	812	56
Apples ...	4,788	56
Peaches ..	672	...
Pears	488	...
Prunes ...	1,680	224

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	12,085
Bananas ...	....	12,400	...
Lemons ..	....	...	169
Oranges ...	....	...	2,072
Grape Fruit ..	....	...	17
Pears	....	...	662
Pineapples ...	....	...	145
Other	....	43	5,633
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches.	Smyrna... ...	180	...
	U.S.A.	14,700	...
Apples ...	....	...	444
Apricots ...	....	...	429
Currants	....	...	92,430
Prunes ...	U.S.A.	46,134	615
Peaches ..	....	...	56
Raisins—			
Sultanas ...	U.S.A.	15,000	2,436
Lexias ...	....	...	...
Other ...	Asia Minor ...	1,080	88
	Spain	313	...
	U.S.A.	12,050	..
Dates	France	1,080	29,902
	Mesopotamia ...	242,791	...
Other—	....	...	1,042
	Asia Minor ...	420	...
	China	1,175	...
	Italy	27	...
	Mesopotamia ...	780	...
	Samoa	971	...
	Smyrna ...	2,240	...
	Turkey	6,750	...
	United Kingdom	2,892	...
	U.S.A ...	4,522	...
Preserved in liquor—			
Apricots ...	....	...	1,280,596
Peaches ...	....	...	1,049,730
Pears ...	....	...	7,851
Pineapples ...	....	...	14,393
Raspberries	....	...	3,186
Other ...	....	...	26,526

CONTENTS.

Agricultural Gazette of New South Wales.

Southern District Potato Crop Competitions, 1927-28.

RESULTS OF LOCAL COMPETITIONS AND R.A.S. CHAMPIONSHIP.

A. J. PINN, H.D.A., Special Agricultural Instructor.*

LAST season local potato crop competitions were conducted in four districts, viz., Batlow, Crookwell, Goulburn, and Taralga. A total of ninety-six entries were received as follows :—Batlow, 17; Goulburn, 17; Crookwell, 42; and Taralga, 20. In conjunction with these district competitions, the Royal Agricultural Society organised a championship competition, for which it donated a silver cup trophy to the value of ten guineas. The competitor scoring highest in each of the local competitions, provided he cultivated a minimum area of 5 acres of potatoes on his farm, was eligible to compete for the championship trophy.

The conditions governing the local competitions and the scale of points used in judging were uniform throughout, except in regard to the minimum areas to be cultivated Crookwell and Taralga stipulating that 5 acres of potatoes had to be cultivated on the entrant's farm, Goulburn 2 acres, and Batlow merely the ½ acre, which was the size of the competition plot submitted for judging in each case. There was also slight variations in the planting dates.

CONDITIONS GOVERNING LOCAL POTATO CROP COMPETITIONS.

Each competitor shall enter a patch of half an acre of potatoes, which he may select in one piece from an area of not less than 5 acres of potatoes on his holding. Not more than one variety of potatoes to be grown in any such half-acre patch.

Competitors must not irrigate their competition plot, but may use any artificial fertilisers in any such quantity as they may deem necessary. Planting of competition crops to be done between dates to be arranged by each local society. Range between dates should be limited to a fortnight or less.

SCALE OF POINTS FOR JUDGING.

	Points
Yield (to be calculated on marketable tubers, *i.e.*, table and seed)	40
Quality	30
Type and Purity	15
Freedom from disease (insect pests and fungous diseases) ..	15

Additional points will be allotted in reference to previous croppings as follows :—

If land has grown 5 crops of potatoes previously	5
" " 4 " "	4
" " 3 " "	3
" " 2 " "	2
" " 1 " "	1

The crops entered for the competition will be examined twice by the judge; the first inspection will be made as near as possible to the flowering period, and the final inspection when the crop is mature.

* Mr. A. J. Pinn judged all four district competitions as well as the championship.

In the event of a farmer making an entry and subsequently finding that the crop is not likely to be in condition to inspect, it is desirable that he send notice to the Secretary of his Society, in order that the judge will not have to pay a visit of inspection.

In the event of a farmer entering the competition, notice will be sent to him of the approximate dates on which the judge will inspect his half acre of potatoes. On receipt of this notice the farmer shall arrange to either be at home himself, or instruct some person to show the half acre to the judge, and supply the following particulars, viz.:—

(*a*) Cropping of land for the past five years.
(*b*) Dates of ploughing and other cultural information.
(*c*) Date of planting.
(*d*) Type of seed (cut or whole, and size)
(*e*) "Seed" (if selected, if dipped, how stored).
(*f*) Method of planting and fertilising.
(*g*) Kind of fertiliser and amount.
(*h*) Cultivation after planting.
(*i*) Name of variety.

All plots were inspected for first judging as near as possible to full flowering time. The first plots were visited on 16th January, and the last on 30th of the same month During this first inspection the percentage of impurities and virus disease was ascertained.

The final judging was commenced on 1st May and finalised on 14th June. Owing to various causes, such as flood damage, loss from disease, excessive impurities, &c., many plots were withdrawn before the final judging, but a total of fifty-two plots remained as follows:—Batlow, 14; Goulburn, 8; Crookwell, 14; and Taralga, 16. At the time of the final visit of the judge the yield was obtained by digging a proportion of the area and taking a sample of the produce of each plot for bench judging, for the purpose of awarding points for quality. Digging of the potatoes was usually carried out by the competitor himself or with the assistance of other competitors. The work of cleaning the potatoes, where necessary, before being picked up and weighed by the judge was often lightened by the ready help given by other competitors. Judging the tubers for quality cannot be done satisfactorily at the farm immediately the crop is dug as it is only possible to secure a true comparison of the appearance and cutting quality when samples of all the plots are ranged alongside one another. In awarding points for quality I again divided the heading, and awarded points for (*a*) appearance and (*b*) cutting quality

Under the heading of disease 1 point was deducted for each 1 per cent. of virus disease up to a maximum of 8 points, the balance of deductions being made chiefly because of scab. Any tubers showing late blight were cast out, and thus points were lost on yield. In regard to points awarded for purity, a deduction of 1 point was made for each ½ per cent. of impurity. In allocating points for yield, the maximum award (40) was given to the highest competitor in each local competition. However, this is not considered quite satisfactory, and experience suggests that points for yield should be allotted on a definite basis, *e.g.*, 5 points for each ton yielded.

In the competitions under review an allowance for previous cropping was made irrespective of the period over which previous cropping extended

For obvious reasons it is desirable that a limit be placed on the period covered by such an allowance and for future competitions it is suggested that the period be confined to cropping within the previous ten years.

In the September issue of the *Agricultural Gazette** there appeared a paper, which had been read by me at the Sixth Annual State Conference of the Agricultural Bureau, pointing out the lessons to be learned from these competitions, and readers are urged to turn up the article in their copies of the *Gazette*, or write to the Department for a copy.

Goulburn District Competition.

This competition was carried out under the auspices of the Goulburn A.P. & H. Society.

Potato growing in the Goulburn district is confined chiefly to isolated areas such as river or creek lands, and, as a crop, therefore, is not of the same relative importance as in the Taralga, Batlow, and Crookwell districts.

It was unfortunate that the season turned out so unfavourable, as it no doubt robbed the contest of much of its value, as many plots had to be withdrawn in consequence of damage by floods and heavy rain, and even in those that remained, disease due to over-wet conditions contributed in varying degrees to deductions being made in the matter of yield, etc. Generally speaking, the quality of the potatoes was poor, and heavy losses in points for quality were experienced by most competitors, particularly as regards cutting quality. Second growth caused a large percentage of stag end tubers, which, of course, reflected adversely on the quality.

RESULTS of the Goulburn A. P. & H. Society's Competition.

Competitor.	Variety.	Yield.	Points Awarded.					Total.
			Yield.	Quality.	Freedom from Disease.	Purity.	Allowance for previous Cropping.	
		t. c. q. lb.						
H. Boreham ...	Factor	6 3 3 27	40	23	13½	15	1	92½
Mills Bros. ...	Up-to-Date ...	4 16 0 3	31	24	14½	14	5	88½
Mills Bros. ...	Brownell's ...	4 15 3 2	31	26	8½	11	5	81½
F. W. Stein ...	Up-to-Date ...	5 7 1 2	34½	12	5½	13	5	70
E. Brogden ...	Redsnooth ...	3 10 2 7	22½	14	11	14	3	64½
C. E. Prell (No. 1)	Carman ...	3 15 1 23	24½	17	13½	0	0	55
C. E. Prell (No. 2)	Factor	3 11 2 13	23	15	13½	0	0	51½
C. E. Prell (No. 3)	Up-to-Date ...	2 19 0 19	19	15	12	0	0	46

Mr. Boreham's winning plot was situated at Merilla, on alluvial soil on the bank of the river, and was flooded on three occasions. Contributing factors to his win were suitable soil and a good strain of seed. At the first

* "Potato Culture—Lessons from Potato Crop Competitions," by A. J. Pinn; *Agricultural Gazette*, September, 1928, page 675.

judging it was apparent that good seed had been obtained, and on inquiry it was found to have come from a well-known grower of good seed in the Taralga district.

Mills Bros.' entry of Up-to-Date gained second place in this competition. The plot was situated on the river bank at Towrang, and consisted of a well-drained sandy soil. The potatoes were free from tuber diseases, and the cutting quality was good.

A Goulburn Competition Plot of Up-to-Date Variety.

Owing to the fact that Mr. Boreham cultivated less than 5 acres of potatoes, that being the stipulated minimum area for the championship, he was ineligible to compete in the Royal Agricultural Society's championship, with the result that the Goulburn district was represented by Messrs. Mills Bros.' plot of Up-to-Date variety.

Taralga District Competition.

This competition was conducted by the local agricultural society in co-operation with the Taralga branch of the Primary Producers' Union. A competition was conducted the previous season and the results of that competition were such as to create still further interest in last season's competition.

The season was in some respects similar to that experienced in most other tableland districts, there being rather too much rain, which caused foliage disease in varying degrees of severity. The varieties cultivated throughout this district did not suffer greatly from the effects of late blight, as did some

Carman and Manhattan crops in other centres where they are grown more extensively. The continuous rain during the growing season largely prevented much of the inter-cultivation which otherwise would have been necessary. On the whole the crops were well looked after and were remarkably free from weeds at the close of the season.

The average yield of the sixteen plots that remained in for final judging was 6 tons 15 cwt. per acre, which must be considered very satisfactory.

It is interesting to note that the Factor and Up-to-Date plots, totalling seven in all, occupied the seven highest positions as regards yield. The high standard of purity of the competition plots is plainly indicated by the table, wherein it will be seen that eleven of the sixteen competing plots secured maximum points and only one lost more than 1 point.

A Taralga Competition Plot of Satisfaction Variety.

Mr. W. J. McPaul entered two plots of Factor and secured first and second awards. The winning plot was situated on better quality soil than that gaining second place, but, whereas the winning plot received no fertiliser, the other plot received an application of superphosphate at the rate of 2 cwt. per acre. The soil, which was new land, was in particularly good "heart" and of excellent quality, being a free-working basalt loam. Between first ploughing and planting the land received four harrowings, and was again harrowed and cultivated after the crop came up. Medium-sized seed was used, portion of which was cut and was dropped after the plough Both crops were of even and vigorous growth. Seed procured from this grower produced the highest yield in the previous season's competition. The average width of rows on Mr. McPaul's plots was 2·6 feet.

RESULTS of the Taralga A. and H. Association's Competition.

Competitor.	Variety.	Yield.	Points Awarded.					Total.
			Yield.	Quality.	Freedom from Disease	Purity.	Allowances for previous Cropping.	
		t. c. q. lb.						
W.J.McPaul (No. 1)	Factor	11 11 3 16	40	25	15	15	0	95
W.J.McPaul (No.2)	Factor	9 5 0 7	32	25	14	15	0	86
D. Wright ...	Factor	7 15 3 2	27	25	13	15	5	85
J. Howard (No. 1)	Factor	8 8 3 16	29	26	13	15	0	83
Johns Bros. (No. 1)	Up-to-Date ...	8 8 1 7	29	23	14	15	0	81
W.J.McPaul (No.3)	Early Manistee...	7 1 3 5	24½	28	13½	15	0	81
J. Howard (No. 2)	Satisfaction ...	6 16 0 13	23½	26	13	15	0	77½
Johns Bros. (No. 2)	Up-to-Date ...	7 2 1 9	24½	25	13	15	0	77½
R. J. Ball ...	Early Manistee...	5 12 2 20	19½	25	13½	15	0	73
M. Hoare	Satisfaction ...	4 19 1 21	17	25	13½	14	3	72½
Baxter Bros. (No.1)	Big Top Brownell	6 3 3 11	21	26	7½	15	1	70½
Baxter Bros. (No.2)	Factor	7 19 0 27	27½	27	14½	0	0	69
J. J. Maloney, snr.	Satisfaction ...	5 16 1 18	20	22	8½	14	2	66½
W. D. Mackenzie	Satisfaction ...	4 11 3 15	16	23	9	14	3	65
Johns Bros. (No. 3)	Carman ...	4 0 0 17	14	20	12	15	0	61
Hillen & Hallgren	Satisfaction ...	2 16 2 16	10	21	10	11	5	60

Mr. D. Wright gained third place in this season's competition with a plot of Factor. Mr. Wright is farming on a less favourable soil than many other competitors, but is a consistent prize-winner for potatoes at various district shows, and was the winner of the previous competition. This grower is a believer in wide planting of the rows, coupled with thorough early preparation of the soil, fertilising, seed selection from high yielding plants, and frequent inter-cultivation. Mr. Wright chose a plot which, through previous cropping, gave him an allowance of 5 points. The wide spacing of the rows (3·1 feet) in this competitor's plots was too great as the season turned out, but Mr. Wright farms for safety and considers that in drier years the extra spacing is advisable on his class of soil.

Crookwell District Competition.

The competition in this district was conducted by the Crookwell A. P. & H. Society.

The district is an extensive one and includes such centres as Roslyn, McAlister, Red Ground, Cottawalla, Kialla, Gullen, Bannindah, and Wheeo. The submission of over forty plots to the first judging speaks well for the widespread interest taken in potato competitions, and it was a regrettable fact that owing to the excessive rainfall so many plots had so be withdrawn later. Of the twelve Carman plots submitted, not one remained in for the

final judging. This variety in particular suffered from late blight and received a set back in popularity, whereas the other white-skins, Factor and Up-to-Date, gained favour owing to the small average loss from disease. Quite a number of plots were withdrawn owing to the large proportion of impurities present. The competition was, no doubt, beneficial in drawing attention to this fault in some competitors' strains of seed, and improvement along these lines can be looked for in the near future. A number of growers will also need to take steps to minimise the amount of tuber scab, which can best be done by dipping the seed and also by adopting a variation in the cropping system, with a view to adding to the organic content of the soil.

Results of the Crookwell A. P. & H. Society's Competition.

Competitor.	Variety.	Yield.	Points Awarded.					Total.
			Yield.	Quality	Freedom from Disease.	Purity.	Allowance for previous Cropping.	
		t. c. q. lb.						
Frost Bros. (No. 1)	Factor	9 19 2 16	40	26½	12	15	3	96½
O Frost	Tasmanian Brownell's.	8 11 3 5	34½	28	14	15	5	96½
M. McDonald ...	Factor	8 11 0 13	34½	27½	14	15	1	92
J. Flood	Factor	6 15 2 17	27	26	12½	15	5	85½
P. Leonard (No. 1)	Tasm. Brownell's	6 5 3 8	25	27½	14	15	4	85½
Frost. Bros. (No. 2)	Tasm. Brownell's	7 14 2 21	31	26½	12½	13	2	85
P. Leonard (No. 2)	Up-to-Date ...	6 9 2 0	26	25½	12	15	5	83½
J. Slater	Up-to-Date ...	6 15 3 18	27	22½	14½	13	5	82
S. Lund	Factor ..	5 12 0 6	22½	26½	12½	11	5	77½
D. Harris	Factor . .	5 7 2 18	21½	25½	8½	15	5	75½
L. Dayton ...	Factor	6 0 0 10	24	25	9½	15	2	75½
T A. Howard ...	Redsnooth ...	4 16 3 11	19½	21	13	15	5	73½
R. Steele	Tasm. Brownell's	3 15 2 17	15	27½	12½	13	5	73
Lowe Bros. ...	President ...	4 2 2 0	16½	24½	13½	14	0	68½

Mr. O. Frost and Messrs. Frost Bros. gained the same number of points and thus divided the first prize. Through the generosity of the local society each of the joint winners received a silver cup.

Mr. O. Frost received a yield of 8 tons 11 cwt. from Tasmanian Brownell's on old ground, which was certainly meritorious. The plot was given a preliminary ploughing in June, that being the earliest ploughing given any plot in this competition. The subsequent harrowings in the spring helped to conserve moisture, and the liberal use of fertiliser was consequently not wasted through lack of moisture. A complete fertiliser was used at the rate of between 6 and 7 cwt. per acre. The rows were close, being approximately only 26 inches wide. Whole seed about 2 inches in diameter was planted on 14th November. The potatoes were harrowed twice after breaking ground. The quick robust top growth and close planting did not allow of further cultivation. The sample of tubers from this plot of Tasmanian

Brownell's together with those of Mr. P. Leonard gained highest award for marketable appearance. Only one-half per cent. virus infection was present.

Messrs. Frost Bros.'s crop of Factor was a credit to the growers, as the high yield of approximately 10 tons per acre indicates. The soil was a basalt loam with good "heart." The tubers dug clean and were of good appearance, being practically free of second growth. The crop was fertilised at rate of 350 lb. superphosphate per acre. Medium-sized seed, which needed some cutting, was planted on 12th November. Two harrowings after the crop broke ground were given. The first inspection at flowering revealed a 2-per cent. infection of a virus disease (mild mosaic), which lost points for the crop. With a little selection to eliminate this slight imperfection, this grower has an excellent strain of seed on hand. This same strain of seed has been in possession of Messrs. Frost Bros. for nine years. A deduction of 1 point was made on account of scab. This sample of white-skin tubers was 1½ points below the red-skin's of Mr. O. Frost in marketable appearance.

A Crookwell Competition Plot of Factor Variety.

Mr. M. McDonald gained third place with a crop of Factor which produced the satisfactory yield of 8 tons 11 cwt. The sample of potatoes from this plot gained the highest points for cutting quality, due no doubt to the crop having been hilled, which operation keeps the tubers away from the discolouring effects of the sun and air. Mr. McDonald secured seed for this plot from Messrs. Frost Bros. First ploughing of land was given on 5th August, and one harrowing was given. A second ploughing was given on 25th October, and the plot was again harrowed. Whole seed about 2 oz.

in weight was planted on 12th November. A mixed fertiliser consisting of 2 cwt. superphosphate and 2 cwt. of a complete fertiliser was used on each acre. The after-cultivation consisted of two harrowings and one inter-cultivation, during which a slight hilling was given. The rows were spaced 2¼ feet.

Batlow District Competition.

The competition in this district was conducted by the Batlow Agricultural Society in co-operation with the local branch of the Agricultural Bureau.

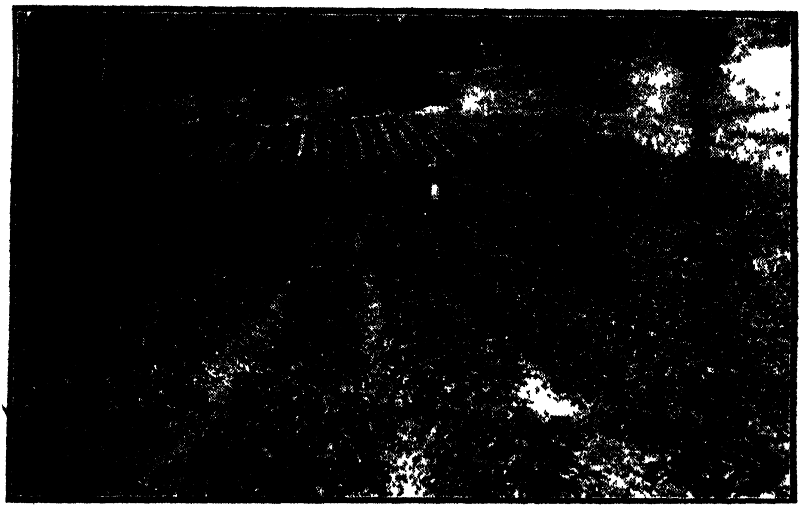
The first inspection of the crops commenced on 17th January. At that time droughty conditions prevailed and some of the crops were languishing for want of rain. At this stage, however, it was noticeable that early cultivation and the ploughing under of green manure had greatly benefited certain crops. The growing of green manure crops in preparation for the cultivation of potatoes cannot but help to increase yields. Indeed, the high yield of the winning plot of Mr. Dodds is largely due to the beneficial effects of humus in conjunction with artificial fertiliser.

At first judging it was not anticipated that the district could produce such a high average yield. It was fortunate, however, that rain arrived in time to benefit the crops before they had advanced too far. And it was most gratifying to find three yields of over 9 tons per acre, and a high average for all plots of 6 tons 8½ cwt.

RESULTS of the Batlow Potato-growing Competition.

Competitor.	Variety.	Points Awarded.					Total.
		Yield.	Quality.	Freedom from Disease.	Purity	Allowance for previous Cropping.	
J. E. Dodds ...	Queen of the Valley	38	28	14	11	5	96
R. Quarmby ...	Factor	40	25	15	13	...	93
J. H. Bryant ...	Factor	39	24	14	14	...	91
E. M. Herring ..	Coronation	37	27½	14	11	1	90½
J. H. Bryant ...	Early Manistee ...	34	29	15	8	...	86
J. E. Dodds ...	Factor	30	25½	14	11	5	85½
E. M. Herring ...	Batlow Redsnooth ...	29½	27½	11	13	1	82
E. M. Herring ...	Factor	20½	25½	15	13	5	79
P. E. Quarmby...	Early Manistee ..	20	27½	14	11	4	76½
D. Christian ...	Batlow Redsnooth ...	18½	26½	14½	15	1	75½
Geo. Smith ...	Batlow Redsnooth ...	17	27	13	13	5	75
J. Quarmby ...	Factor	17½	24½	14	13	5	74
Geo. Smith ...	Coronation	21	26½	14	7	5	73½
J. H. Bryant ...	Batlow Redsnooth ...	12½	28	13½	13	5	72

Mr. J. E. Dodds secured the honours in this competition, his plot being on land that had previously been cropped with potatoes to such an extent that he was allowed the maximum of 5 points for previous cropping. The high yield and absence of second-growth tubers was an indication of uniform moisture content throughout the growth of the crop. Mr. Dodds' plots were the latest sown (2nd and 3rd December) and this, no doubt, helped the crop slightly in view of the early dry conditions. The condition of the soil was not typical of old land, but rather that of land well supplied with organic matter. Mr. Dodds attributed this condition to the ploughing under of a prolific weed crop, which developed before the ploughing of the land in September. After the preliminary preparation, the surface soil was kept



A Batlow Competition Plot of Early Manistee Variety.

in a loose condition, three harrowings being given before planting The tubers of this crop were very uniform for this variety, and it seems evident that a good strain of seed was used. The seed was selected at digging and the elimination of poor types was evidently a big factor in bringing about such uniformity. The incorporation of organic matter and constant surface cultivation evidently provided a high moisture content, which allowed the fertiliser to function. A mixture of six parts superphosphate and one part sulphate of ammonia was applied in the drills at planting time at the rate of 5 cwt. per acre. Subsequent cultivation comprised a harrowing when the plants had broken ground and two inter-cultivations later in the growth.

As the winner cultivated less than 5 acres of potatoes, the district was represented in the R.A.S. Championship by Mr. R. Quarmby, who gained second place in the local competition with a crop of Factor.

Mr. R. Quarmby selected a plot of new land, which was first ploughed on 5th September, and cultivated two ways with a spading harrow on 7th November. Planting with whole seed (average 2 inches in diameter) was carried out on 25th November, no fertiliser being used. The crop was inter-cultivated on two occasions.

Mr. J. H. Bryant gained third place with a plot of Factor.

This competitor also selected new land, and gave it a preliminary ploughing of 7 inches on 11th July. On 27th September the land was harrowed both ways, and on 21st October was cross-ploughed and later harrowed. Planting was carried out on 18th and 19th November. An equal area of whole and cut seed was planted on the half acre, and altogether 3 cwt. of whole seed ranging from 2 to 3 oz., and 3½ cwt. of cut seed were used. Seed was pitted after digging until 17th October, when it was spread out on the floor of the shed and left to green until planting time.

Fertiliser was applied in the rows at planting time at the rate of 180 lb. superphosphate and 40 lb. sulphate of ammonia per acre. The plot was harrowed immediately after planting, and bracken fern was kept pulled until the plot was scarified on 14th January. A rather large percentage of second growth caused loss of points to this grower, both on account of appearance and cutting quality. This grower's sample of Early Manistee was particularly fine, and secured maximum points for appearance and only lost 1 point for cutting quality.

The crops throughout this district were remarkably free from virus disease; no deductions being made on this account in nine out of the fourteen plots, while two other plots lost only 1 point, and a further two lost 2 points each. An improvement, however, can be looked for in future in regard to purity, as only one competitor secured full points under this heading.

Royal Agricultural Society's Championship.

The methods adopted by successful growers in each of the district competitions have already been referred to in the foregoing pages. The winner of each district competition was eligible to compete for the Championship provided he cultivated the stipulated minimum of 5 acres of potatoes on his farm. This condition necessitated the withdrawal of the winners of the Batlow and Goulburn competitions, those districts being represented in the Championship by the next highest competitor in each instance.

The points awarded at time of first inspection for purity and freedom from virus disease were retained in the final adjudication, as also was the yield secured in each case in the local competition. It was, however, necessary to readjust the points awarded for yield in the local competitions to bring them all into line.

It would have been unfair in judging the Championship to have compared samples dug for the purpose of the local competition. Accordingly, upon completion of the local competitions, a fresh sample was taken from the plot of each of the eligible competitors, and again submitted to bench judging.

Results of the R.A.S. Championship.

	Points.
1. W. J. McPaul, Richlands, Taralga	
Factor, 11 tons 11 cwt. 3 qr. 6 lb. per acre	97½
2. O. Frost, Bannister, Crookwell.	
Tasmanian Brownell's, 8 tons 11 cwt. 3 qr. 5 lb. ...	91
3. R. Quarmby, Batlow.	
Factor, 9 tons 12 cwt. 3 qr. 5 lb.	86½
4. Mills Bros., Towrang, Goulburn.	
Up-to-Date, 4 tons 16 cwt. 3 lb.	74

Competitor.	Yield.	Quality.	Freedom from Disease	Purity	Allowance for previous cropping.	Total.
W. J. McPaul, Taralga ...	40	27½	15	15	Nil.	97½
O. Frost, Crookwell	29½	27½	14	15	5	91
R. Quarmby, Batlow	33½	25	15	13	Nil.	86½
Mills Bros., Towrang	16½	24	14½	14	5	74

Comments by the Judge.

There is no doubt that the competitions have been of great educational value, particularly in demonstrating to growers the necessity for eliminating degenerate types from their growing crops. In anticipation of further competitions, many growers are now making field selections with a view to the planting of next year's competition plots, which will virtually be the stud plots of the farm. These plots will in turn be drawn on for the seed for planting the main crop, and a general improvement in yield and quality should be the outcome.

In conclusion I desire to thank the many competitors who, in a number of ways, assisted in bringing the competitions to a successful close.

Queen Bees and Nuclei Colonies.

The attention of bee-keepers is directed to an advertisement in this *Gazette*, advising that the prices to be charged for queen bees and nuclei colonies supplied from Hawkesbury Agricultural College and Wauchope Government Apiary, will be the same as last year, viz., queens, untested 7s. 6d., tested 12s. each. Ten queens are supplied for the price of nine.

Nuclei colonies with untested queens are available at 32s. 6d., and with tested queens at 37s. The prices cover Italian and Carniolan queens crossed with Italian strain, freight being paid to any railway station in New South Wales. Ten colonies are supplied for the price of nine.

Sweet Potato Trials, 1927-28.

(1) Farmers' Experiment Plots.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE principal work carried out during the past year was the distribution throughout the State of proved and better types of sweet potatoes. Many inquiries reached the Department for tubers and cuttings, and a wide distribution of these proved types was obtained.

One phase of the work which has not been touched on before is the value of this crop in the western districts. Sweet potatoes have been grown in certain localities beyond the tablelands for a number of years with marked success. The crop is not drought resistant, but withstands the heat and responds to irrigation. During the early stages of growth very little water is required, but during the last few weeks, when the roots are filling out, the plants will absorb an astonishingly large amount of water. The more thorough the preparation of the soil, the better the results. It is, therefore, recommended that the soil be given an early preparation, and, if possible, well rotted organic manure worked into the soil.

For the home garden it is recommended that only a small area be cultivated. Many market gardeners along the western rivers grow an acre or two with marked success. Mr. Sunderland, of Dubbo, grew an acre of the White Maltese during the past season, which gave a yield of 15 tons. Several of the improved varieties of sweet potatoes were sent to Mr. J. C. Rowcliffe, "Fairfield," Dubbo, for trial. The season was a very good one in the western districts, and remarkable yields were obtained. It might be pointed out, however, that these trials, which were under irrigation, were on a limited scale in Mr. Rowcliffe's market garden. This grower obtained yields up to 25 tons per acre.

Manurial Trial.

Mr. E. Rasmussen, of Wyong, co-operated with the Department in carrying out a manurial trial, with the object of ascertaining which manure gave the most payable increase in yield. The variety used in this trial was the H.A.C. Pink, which is better known throughout the State as "Pink." The piece of land on which this experiment was conducted had, with one exception, been planted each spring with sweet potatoes for the last twelve years. This undoubtedly accounts for the remarkable increases in yield obtained from all the fertilisers used. The soil is a sandy loam, and most suitable for the growing of sweet potatoes. Owing to the lateness of the spring crops, all farm operations were delayed, and it was not until 1st January, 1927, that planting took place.

RESULT of Manurial Trial.

	t.	c.	qr.
M22 (336 lb. per acre) ...	13	11	1
Superphosphate (672 lb. per acre)	11	16	0
Superphosphate (336 lb. per acre)	10	5	2
P11 (392 lb. (per acre) ...	9	3	3
P13 (448 lb. (per acre) ...	7	11	1
No manure (average) ...	5	8	0

M22 mixture comprises equal parts of bonedust and superphosphate; P11 six parts superphosphate and one part sulphate of ammonia; and P13, six parts superphosphate, one part sulphate of ammonia, and one part sulphate of potash.

The larger cracks in the soil on the manured plots made it apparent at time of harvesting that the fertiliser had considerably increased the yield. On lifting the roots, it was also found that the manured rows were a good deal more mature than the unmanured ones. The results show that M22 fertiliser mixture (equal parts of bonedust and superphosphate) produced the most payable increase in yield. The plant foods in this mixture are made available over a longer period than in the case of the other fertilisers. The superphosphate becomes available and is used by the plants during the early stages of growth. The bonedust, on the other hand, takes some time to break down in the soil and become available to the plants. It is when the roots are beginning to fill out that the plants require an abundance of plant food and moisture, and it is at this stage that the bonedust becomes available and considerably increases the yield. The yields obtained in the trial indicate that superphosphate is superior to a mixture of either nitrogenous or potassic fertilisers with superphosphate. By doubling the dressing of superphosphate an increase in yield of 1 ton 10½ cwt. was produced. M22, the mixture which produced the highest yield in this trial, has given good results in previous years, and at this stage can be recommended as the most reliable fertilising mixture to use with sweet potatoes. It must be borne in mind that increases similar to those obtained in this trial cannot always be produced, as these results were obtained on soil which, as described before, was more or less "run out."

Variety Trials.

Work in this section during the year mainly involved the distribution of better quality sweet potato varieties throughout the State. A fairly extensive trial was conducted in co-operation with Mr. S. Redgrove, of Sandhills, *via* Branxton. This grower has had a lifetime experience in the growing of sweet potatoes, and obtains some remarkable results. Mr. Redgrove places all his produce on northern markets, where pink-skinned sweet potatoes are in demand. These pink-skinned varieties, generally speaking, are of superior quality to the white-skins. Porto Rico is a pink-skin, and perhaps our best-quality variety. This variety is usually not a good keeper, but in the raw sand at Branxton compared very favourably in keeping quality with other varieties.

This experiment was conducted with the object of ascertaining the best yielding and most suitable variety of sweet potato for the Branxton district. The soil on which this trial was sown was raw sand. The only manure used

was a little cow manure distributed over the plots a few days before planting. The plants were sent from Grafton and were in a bad condition when received, which accounted for the poor growth made in the early stages. This check prevented the varieties from maturing before the winter, hence the yields, although high, would have been higher under normal conditions.

RESULTS of Variety Trials.

	S. Redgrove, Branxton.			E. Rasmussen, Wyong.		
	tons	cwt.	qr.	tons	cwt.	qr.
Yellow Strassburg	13	13	2	....		
Nancy Hall	12	8	1	4	17	1
Pierson	12	8	1	....		
Southern Queen	11	10	1	....		
Director	9	10	3	....		
Porto Rico	8	16	1	3	10	1
H.A.C. Pink*	16	12	3	5	8	0
Brook's Seedling	....			4	6	2

* This variety was planted much earlier than others in this trial, hence the yields are not comparable.

Yellow Strassburg and Nancy Hall again produced the heaviest yields, and over a number of years should prove to be the most profitable varieties to grow. The H.A.C. Pink is a variety largely grown throughout the State. It is a pink-skinned variety, and is an exceptionally heavy yielder and good keeper. The flesh is cream in colour and of fair quality, although some strains contain a good deal of fibre. The roots are not long, but chunky, and grow to an enormous size, making them valueless for market purposes. The size, however, can be kept down by planting the cuttings closer in the field. Another very marked defect is that the tubers are of a bad shape, rendering them very wasteful for domestic purposes.

(2) Grafton Experiment Farm.

R. J. DAVIDSON, H.D.A., Experimentalist.

Variety and fertiliser trials with sweet potatoes were planted at Grafton Experiment Farm during the past season. The fertiliser trial was so damaged by scouring as a result of heavy rain that it was abandoned.

The Variety Trial.

This was planted on the same lines as last year. Following a dry, cold winter, a good rainfall was experienced from the latter end of September until December, when it fell short of requirements. From early January until the end of February it was phenomenally heavy and continuous, and culminated in a flood. Thence frequent showers were experienced, and the total rainfall up till harvesting was much above the average.

MONTHLY Rainfall.

Before Planting.		*After Planting.*	
July	42 points.	November (9th to 30th) ...	225 points.
August	40 ,,	December	111 ,,
September	375 ,,	January	836 ,,
October	357 ,,	February	1,241 ,,
November (1st to 9th) ...	173 ,,	March	363 ,,
		April	688 ,,
		May	272 ,,

Cultural Notes.

The trial was located on sandy soil, previously cropped with peanuts. It was disc ploughed on 15th July, 1927; springtoothed on the 4th October; harrowed on the 5th October; springtoothed on 4th November. The soil was in excellent condition at planting time, and the weather cool and showery.

Rooted plants of the following varieties were dibbled in on 9th November, 2 feet apart, in rows 3 feet apart, with 5 feet between plots :—Porto Rico, Boyne River, Brook's Seedling, Triumph, Georgia, Farmers' Special, Pierson, Bon Accord, Yellow Strassburg, Mammoth Cattle, White Yam, Director, Nancy Hall, Brook's Gem, Southern Queen, and Vitamine.

Each plot was ·04 acre in area. An excellent "strike" was obtained The experiment was inter-row cultivated and hoed on 28th December As the trial was situated on a sandy slope, some damage was caused by heavy rain scouring the soil away from the roots at the lower end of the site. The wet season favoured weed growth, principally summer grass, of which a fair amount appeared throughout the plots. Harvesting was delayed by wet weather conditions. A section of each plot 1 chain long was dug on 9th June. The following results were obtained.—

Variety	Yield per acre t.	c.	q.	lb.	Variety	Yield per acre t.	c.	q.	lb.
Georgia	16	3	0	14	Yellow Strassburg ...	8	9	3	18
Brook's Seedling ...	15	9	1	14	Nancy Hall	8	4	0	2
White Yam	12	6	2	2	Director	7	12	0	26
Farmers' Special ...	11	8	3	10	Triumph	7	6	1	10
Southern Queen ...	10	19	0	2	Brook's Gem ..	7	4	1	14
Boyne River	9	8	2	8	Porto Rico	6	6	2	22
Vitamine	9	7	2	10	Mammoth Cattle ...	4	10	0	22
Pierson	8	11	3	14	Bon Accord	3	8	3	0

Notes on Varieties.

Porto Rico.—Vine growth good, up to 12 feet; roots salmon coloured, fusiform to turnip-shaped, good size, showing much splitting; a good many rotted in the field. An excellent table variety, with sweet flesh of good texture; keeping quality is poor, and yields here are low; flesh yellowish-pink in colour.

Boyne River.—A White Maltese type; long fusiform, badly-shaped roots, yellowish-white in colour; showed some splitting and rotting in the field; white flesh, vines to 8 feet long; not a very heavy yielder, and produced a fairly high percentage of small, thin roots.

Brook's Seedling.—Vines long, up to 15 feet. This variety produced flowers. Roots of good type, mostly turnip-shaped, and of good size and fairly smooth; slight splitting and some rotting in the field; yellowish-white roots and flesh; yields well and seems a desirable variety for local conditions.

Triumph.—Short vines, up to 6 feet; roots yellow, short cylindrical to Maltese type; big percentage of small, thin roots; yellow flesh; kept badly in store last season.

Pierson.—Vines medium height; roots show some splitting; yellowish-white, with white flesh; excellent quality and sweet. Fusiform to turnip-shaped; smooth; fairly big percentage of small, banana-like roots. Should be an excellent variety if improved by selection.

Yellow Strassburg.—Vines to 7 feet long; roots yellowish-white; flesh cream-coloured; turnip-shaped to globular; smooth and of a good size; a little splitting; very few small roots. This is a good table sort for this district.

Southern Queen.—Long vines, foliage not abundant; roots globular to turnip-shaped; smooth; yellowish-white skin and flesh. A good table sort, which yields fairly well.

Georgia.—Very large, rough, and irregular roots, up to 10 lb. weight, with very few small roots; globular to short cylindrical in shape, showing much splitting; kept badly in store last season; white skin; white flesh; has given the highest yield for the last three seasons. This is a good stock variety

Director.—Vines to 6 feet long; foliage plentiful; roots White Maltese type, some globular, a good many small and thin; light-yellow skins and white flesh; showing very little splitting.

Nancy Hall.—Vines to 10 feet; even roots, globular to turnip-shaped; yellow skin and flesh; very good table variety, but has not proved a heavy yielder under local conditions.

Brook's Gem.—Vines to 6 feet; roots smooth, White Maltese type; light-yellow in colour; flesh white.

Remarks.

Root splitting and rotting in the field were probably accentuated by the continuous wet weather, which delayed harvesting Those varieties which so far have not given good results in the trials will be eliminated, and only the highest yielding and most desirable sorts replanted next season.

(3) Wollongbar Experiment Farm.

S. C. HODGSON, H.D.A., Experimentalist

Sweet potato variety and manurial trials were conducted at Wollongbar Experiment Farm during the past season. Both trials were carried out on a similar class of soil of volcanic origin, the previous crop in each case being

maize for grain. The land was ploughed on 13th August, 2nd September, and 14th October, 1927; springtooth cultivated 25th November; and ploughed and harrowed on 14th December.

The tubers were planted in propagation beds on 25th August, 1927. At one stage the young plants were attacked by larvæ of the sweet potato moth (*Protoparce convolvuli*), but these pests were easily exterminated by spraying with lead arsenate.

Variety Trial.

Planting was carried out on 15th December, 1927, by dibbling young plants in rows 3 feet apart, with a distance of 2 feet between plants in the rows.

The following varieties were included in the trial:—Nancy Hall, White Yam, Southern Queen, Yellow Strassburg, and Brook's Seedling. There were two rows of each variety, 4 chains long and 3 feet apart, making the area of each plot $\frac{2}{55}$ acre. Fertiliser mixture M22 (equal parts of superphosphate and bonedust) was applied at the rate of 2 cwt. per acre.

As rainy conditions prevailed at planting time, a successful "strike" was made. The plots were scuffled when necessary, until the end of January, when the plants had so completely overgrown the rows that it was not possible to cultivate any longer. The rainfall from time of planting out until harvesting (8th June, 1928) was 4,255 points.

RESULTS of Variety Trial.

Variety	Yield per acre. t.	c.	q.	lb.	Variety	Yield per acre t.	c.	q.	lb.
Yellow Strassburg ...	3	7	3	2	Nancy Hall	1	15	1	12
Brook's Seedling ...	3	7	0	4	Southern Queen ..	1	9	1	24
White Yam	3	2	2	13					

Remarks.

Everything pointed to excellent yields until the "curly top" disease made its appearance throughout the plots. This considerably diminished the prospects of good yields. As the disease seemed to be spread through all the plots to the same degree, there was no apparent difference in the susceptibility of the different varieties, but the slower maturing varieties were unable to develop tubers before becoming infected, and gave lighter yields on that account. This was the first appearance of the disease for a number of years.

Manurial Trial.

Planting was carried out on 14th December, 1927, the varieties selected for the trial being Nancy Hall and Yellow Strassburg. The rows were 4 chains long and 3 feet apart. There were two rows in each plot, one being Nancy Hall and one Yellow Strassburg. Thus the area of each plot was $\frac{2}{55}$ acre—half being planted with Nancy Hall and half with Yellow Strassburg.

The "strike" was generally satisfactory, but for some reason the plot manured with P13 mixture did not commence to grow as soon as the others. It is difficult to say why a complete manure like P13 should have had this

effect.. The subsequent growth was good, till the appearance of "curly top," which diminished the prospective yields as it did in the variety trial.

Harvesting took place on 9th June, 1928, and the yields were as follows :—

RESULTS of Fertiliser Trial.

Treatment.	Acre Yields.							
	Yellow Strassburg.				Nancy Hall			
	t.	c.	qr.	lb.	t.	c.	qr.	lb.
M22 (560 lb. per acre)	4	2	2	0	1	18	3	5
Superphosphate (280 lb. per acre) ..	2	19	1	19	1	18	1	6
P11 (327 lb. per acre)	2	18	3	20	1	14	3	13
P12 (327 lb. per acre)	2	13	0	4	1	10	1	22
P13 (373 lb. per acre)	2	12	0	6	1	8	1	26
No manure (check)	2	12	0	6	1	4	0	7

P11 fertiliser mixture consists of six parts superphosphate and one part of sulphate of ammonia; P12, six parts superphosphate and one part of sulphate of potash; P13, six parts superphosphate, one part sulphate of ammonia, and one part sulphate of potash and M22, equal parts superphosphate and bonedust.

It will be seen that superphosphate gave better results than M22 in the Nancy Hall section of the plot, but that M22 gave the greatest total plot yield.

Remarks.

It has often been stated that manures are useless for sweet potatoes, but this is certainly not confirmed by the results of these experiments. This trial will be repeated for a number of seasons to enable definite conclusions to be arrived at. Although no recent manurial trials have been carried out at Wollongbar Experiment Farm to confirm this year's results, it is interesting to note that, in a trial carried out as far back as 1909, both superphosphate and bonedust gave a good increase in yield. These two manures were not at that time applied in a mixture, but each was applied separately. During last year's trials a mixture of these two fertilisers came out on top. Superphosphate also gave good results last season and on account of its cheapness may be the most economical one to apply.

SEED AND PLANT INTRODUCTION.

A VIGOROUS policy of seed and plant introduction has been instituted by the Plant Breeding Branch, which is specifically charged with this work. Sudan grass is an example of an alien plant that has made good, while many of our leading varieties of vegetables and of other farm crops are introductions from other countries. Farrer could not have produced his Federation wheat without the introduction of early maturing wheat from India and Fife wheat from Canada, both of which enter into its breeding. Seed introduction therefore has a dual purpose—possibly a direct value, and an indirect use by the plant breeder for cross-breeding.—H. WENHOLZ, Director of Plant Breeding.

A Convenient Maize Crib Hoist.

L. S. HARRISON, Special Agricultural Instructor.

AN efficient, easily constructed, and convenient box elevator for filling maize cribs is described and illustrated hereunder, the one referred to having been operated on the property of Mr. R. Webb, of Gippsland, Victoria, this past season. It was used in this case with an unroofed crib, the customary type of crib in use in that district, but a type that is not altogether to be recommended on account of weather damage. The difficulty with the New South Wales type of roofed crib can be overcome satisfactorily by having sections of roofing iron wired on, and thus movable.

The Box being Filled at Wagon's Side.

The apparatus is useful in cases where the cobs are pulled into bags or direct into the wagon, the box illustrated holding the equivalent of six bags of husked cobs. The construction is easily carried out on the farm, all rough timber being used, except in the case of the box, which is made of sawn wood, and the dimensions of which are 4 x 4 x 3½ feet. For a crib 12 feet high the main poles are approximately 18 feet long and 4 to 5 inches mean diameter, and both poles are morticed into a round log set on the ground, and the tops roped to the farther side of the crib with a couple of cross-bars secured to the poles for rigidity.

A hinged doorway is fitted to the box, and when over the crib the door is opened by the action of a projecting board on the top cross-piece turning the securing latch. A double block is fixed to the box and another double block to the top cross-piece. About 100 feet of rope is sufficient to enable

one horse to do the lifting work, in the case of the hoist described in this article an old wooden roller was used as an anchor to hold the rope low enough for the horse. When moving the crib along a horse pulls the bottom log and the apparatus is reset in the necessary position. The two photographs reproduced in this article are by courtesy of Mr. G. Magg's, of Melbourne.

The Box at Top with Trap-door Open.

Fitzroy Seed Maize Test at Grafton Experiment Farm.

In order to encourage those farmers who are growing Fitzroy maize, which has become one of the most popular varieties on the coast, the Department of Agriculture has arranged to continue the tests with different strains of seed at Grafton Experiment Farm. These will take the form of yield tests, and it is intended to sow seed of the various strains on a selected area at the Experiment Farm. The Department's certificate will be awarded to the winner of the test.

Farmers who have devoted attention to seed selection and who, therefore, have good strains of the variety named, are invited to forward 5 lb. of seed to the Manager, Experiment Farm, Grafton, immediately. It will be necessary to limit the number of competitors to about twenty-five, and the Department also reserves the right of refusing any entry not sufficiently pure or true to type, so that the purity of seed at the farm will not be endangered. Somewhat similar tests have been conducted in the past on the North Coast and have proved of considerable value in improving the yielding qualities of maize, and have also been of considerable value to farmers by reason of the demand which has been created for seed. It is anticipated that similar results will be obtained from this coming test at Grafton.

Enquiries with regard to this test should be addressed to the farm Manager, or to the Under-Secretary, Department of Agriculture, Sydney.

HAWKESBURY DISTRICT MAIZE YIELD CONTEST, 1927–28.

HEREUNDER are published the results of the maize yield contest carried out in conjunction with the Hawkesbury District Agricultural Association.

The conditions under which the contest was conducted were the same as last year. Eighteen entries were received, including two non-competitive entries from the Department. Three separate plots were sown on the farms of Messrs. Charley Bros., Clarendon; J. Greentree, Freeman's Reach; and J. H. Taylor, Richmond. The entries were as follows:—

Hawkesbury Agricultural College	Large Red Hogan.
" "	Hickory King.
A. S. Holland	Large Red Hogan.
J. Greentree	Large Red Hogan.
"	Yellow Hogan.
R. Turnbull	Yellow Hogan.
Messrs. Horan Bros.	Yellow Hogan.
" "	Large Red Hogan.
A. Greentree	Pride of Hawkesbury.
"	Giant White.
"	Silvermine.
S. A. Tuckerman	Golden Beauty.
"	Yellow Hogan.
C. Gow	Yellow Hogan.
"	Glittering Gold.
"	Leaming.
J. H. Taylor	Wellingrove.
T. H. Turnbull	Fitzroy.

The results of the competition, calculated on a uniform basis of 14 per cent. moisture, were as follows:—

Competitor	Variety.	Yield. J. Greentree.		Charley Bros.		J. H. Taylor		Average.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
C. Gow ...	Yellow Hogan ...	80	37	73	37	121	0	91	43
A. Greentree ...	Pride of Hawkesbury	101	14	94	53	77	26	91	12
J. Greentree ..	Large Red Hogan ...	71	1	104	42	93	35	89	45
Dept. of Agric. ..	Large Red Hogan ...	66	5	90	39	104	9	86	55
C. Gow ...	Leaming ...	71	41	91	46	95	54	86	28
J. Greentree .	Yellow Hogan ...	67	11	81	42	107	11	85	22
T. H. Turnbull ..	Fitzroy ...	66	0	83	37	96	23	82	1
A. S. Holland ..	Large Red Hogan ...	72	41	83	31	87	30	81	15
R. Turnbull ..	Yellow Hogan ...	74	48	91	8	77	14	81	5
Horan Bros. ...	Yellow Hogan ...	59	8	88	39	94	19	80	41
S. A. Tuckerman	Yellow Hogan ...	64	24	87	43	88	55	80	22
J. H. Taylor ...	Wellingrove	64	30	84	19	80	6	76	18
A. Greentree ...	Silvermine	68	3	79	22	78	35	75	20
Horan Bros. ...	Large Red Hogan ...	54	24	79	31	87	15	73	42
S. A. Tuckerman	Golden Beauty ...	61	27	77	55	80	30	73	19
C. Gow ...	Glittering Gold ...	61	33	69	49	83	47	71	43
A. Greentree ...	Giant White ...	59	30	84	2	67	10	70	14
Dept. of Agric. ...	Hickory King ...	53	23	71	10	69	35	64	41

—E. A. SOUTHEE, Principal, Hawkesbury Agricultural College.

Field Maize Competition.

DORRIGO AND GUY FAWKES AGRICULTURAL ASSOCIATION.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE Dorrigo and Guy Fawkes Agricultural Association conducted a field maize crop competition during the 1927-28 season, the conditions being that entries closed on 30th April, 1928, and each entry had to be half an acre in area in one piece of crop. Owing to the late closing date, only one inspection was made, the crops then being ripe. Points for cleanness of cultivation, weed control, and general appearance, condition, evenness, etc., of crop were not considered, as such points can only be awarded when the crop is inspected at the tasselling or cobbing stage. The points on which the crops were judged are as follows:—

	Maximum points.
1. Germination or stand...	10
2. Freedom from insect pests and disease	10
3. Purity and trueness to type..	15
4. Estimated yield, 3 points for every 10 bushels.	

The season was a favourable one, and the three crops inspected were very good.

Details of the Crops.

Miss I. M. Wright, Paddy's Plain, had the winning crop, which was grown on land that had been brought under cultivation four years previously, and cropped with oats and maize in rotation, The soil was a friable, dark chocolate loam, and was ploughed shallow, harrowed and drilled just prior to planting. Planting was carried out during the second week in October, the seed being dropped by hand in rows 3 feet 6 inches apart, three grains every 30 inches in the rows. The crop was scuffled once. The variety was Silvermine, and the yield obtained was 131 bushels 11 lb. per acre.

Mr. R. Grace's crop, at North Dorrigo, was grown on land that had been under cultivation for three years, and had been previously cropped with maize and potatoes. The soil was a friable, red, volcanic loam, and was ploughed, shallow-disced, and harrowed just prior to planting. Planting was carried out during the second week in October with the maize-dropper in rows 3 feet 8 inches apart, two grains every 28 inches in the rows. The crop was scuffled once. The variety was a strain of Silvermine which Mr. Grace has been selecting for a number of years. The yield obtained was 69 bushels 26 lb. per acre.

Mr. A. Wright's crop on Paddy's Plain was grown on land that had been under cultivation for eight years, and had been previously cropped with maize. The soil was a friable, dark chocolate loam, and was ploughed and harrowed just prior to planting. Planting was carried out during the second week in October. Shallow drills were opened with the plough, 3 feet 6 inches

apart, and the seed dropped with the maize-dropper, three grains every 27 inches in the bottom of the furrow. The crop was scuffled three times, and hilled with the plough. Silvermine was the variety used, and the yield obtained was 55 bushels 30 lb. per acre.

AWARDS, Dorrigo and Guy Fawkes Field Maize Competition.

Competitor.	Variety	Germination or Stand.	Freedom from Insect Pests and Diseases	Purity and Trueness to Type.	Estimated Yield	Total
		Points.	Points.	Points.	Points.	Points.
Miss I. M. Wright, Paddy's Plain.	Silvermine	9	8	12	39	68
Mr. R. Grace, North Dorrigo.	Silvermine (Grace's Strain).	9	8	14	21	52
Mr. A. Wright, Paddy's Plain.	Silvermine ...	7	7	12	18	44

Judge's Remarks.

Miss I. M. Wright's crop was excellent, and the yield of 131 bushels 11 lb is extraordinary for the district. It was, however, particularly well situated and protected from the prevailing winds—a set of conditions not usual in the Dorrigo district.

Mr. R. Grace's crop, yielding 69 bushels 26 lb., was grown under conditions typical of the maize-growing areas of the district, and can also be considered excellent. The strain of seed used in this plot was of excellent type, being a strain of Silvermine which Mr. Grace had been selecting for a number of years, and appears to suit Dorrigo conditions very well.

MANURES FOR WATER-MELONS.

RESULTS of Departmental experiments have shown that judicious manuring greatly improves the water-melon crop as regards both early maturity and yield. It has been found that water-melons do best on virgin soil, because of its high humus content. The humus can be greatly increased in cultivated soils by ploughing under green manure crops, or by adding organic manures. Water-melons do well in soil that has been thus treated, providing the green crop or manure has been ploughed under sufficiently early to allow it to thoroughly decay before seeding time.

Experiments with fertilisers in the coastal districts have clearly demonstrated that the addition of 3 cwt. basic superphosphate per acre gives excellent results. This fertiliser should be worked into the soil within a radius of 3 feet of each hill before planting. Basic superphosphate not only greatly increases the yields, but produces the fruit much earlier than unmanured crops. This fertiliser has given good results on the richest river flats and also on the lighter loams of the higher country. Basic superphosphate can be made on the farm by adding one part of air-slaked lime to four parts of superphosphate.—J. DOUGLASS, Agricultural Instructor.

Pea-growing in Rotation with Wheat.

W. S. KELLY, South Australia.*

IT is generally recognised that some form of rotation with wheat-growing is essential. Nevertheless, the bare fallow and wheat practice has been followed in South Australia for over half a century. And it has bee apparently successful until the last eight or ten years. Many had begun to argue that no other crop need be grown. Now, however, it is obvious that land that has been continually under wheat or fallow has lost much of its fertility, while those who have practised the rotation of fallow-wheat-pasture, or fallow-wheat-oats, or fallow-wheat-barley, have maintained much of the fertility of their soils, and are now growing decidedly better crops than those who have grown nothing but wheat. Hence a very definite increase in the interest displayed towards rotations. The maintenance of the fertility of the soil should be one of the fundamental interests of the true farmer.

Tests to be Applied to a Rotation Crop.

In order to judge the value of a crop in a rotation, three facts should be studied.

1. The earning capacity of the crop itself.
2. The effect on the immediately succeeding crop.
3. The ultimate effect on the fertility of the soil.

I propose, therefore, to examine the pea crop from these points of view. Before doing so, however, I would like to stress the point that I am dealing with pea-growing in typical wheat areas. Formerly, with us, peas were thought to be suitable for the wetter districts, but unsuitable for wheat lands. Even yet the yields may be heavier in the damper districts, but it has been definitely proved that this crop can be successfully cultivated where wheat has yielded satisfactorily.

It is difficult when dealing with the growing of any crop not to quote the rainfall as indicating the suitability or otherwise of the climatic conditions. And yet we know that the annual rainfall is often not a sure indication, particularly when comparing South Australia with New South Wales. Our rainfall is better distributed for wheat-growing than is yours. We have less fall in the summer and a greater proportion of "useful" rain. Hence when I speak of 20 inches you must remember that I speak in terms of South Australian rainfall, where we may expect 15 or 16 inches out of the 20 inches to fall during the growing period. Also, I think that our rainfall is better distributed from year to year than is yours.

* Paper read at the Sixth Annual State Conference of the Agricultural Bureau, held at Hawkesbury Agricultural College, July, 1928.

The Return per Acre.

After sixteen years of growing peas in rotation with wheat, I estimate that the returns that may be expected under a 20-inch rainfall should average not less than one bag per acre less than the wheat average. Ever since the advent of the pea-harvester we have always fed a portion of our peas direct to the sheep. Hence it is difficult to give exact yields, but as near as I can tell we have averaged 21 bushels during the last ten years. Many of these crops, however, have been seriously affected by the presence of weeds. Peas, of course, tend to encourage rather than to choke out weeds, and great care needs to be given so that the weeds are killed while they are young. Given good cultivation and the choice of improved varieties as are now available, I have every confidence in estimating that the pea-crop should yield not less than 24 bushels per acre on a good farm with a 20 inch raintall.

The price of peas in our State varies from 5s. to 7s. per bushel. This year good seed is worth up to 10s. per bushel. But this is due to the ravages of the grub, which were very serious last year. The earning value of a pea crop, then, should be from about £6 per acre gross. But it may be argued that if many adopted pea-growing the market would be swamped. Certainly we have not yet opened up a successful export trade with peas. Even so, I have little fear that peas will be a drug on the market. They are particularly rich in protein, showing a percentage of 20, as against from 8 to 10 per cent. for oats. Add to this the fact that peas weigh 60 lb. to the bushel, as from 40 lb. for oats, and one can see that 1 bushel of peas should be worth, as a concentrate, 3 bushels of oats. And this is in accordance with my experience extending over a number of years of feeding of grain to stock. I do not think that anyone who has realised the value of peas will sell them at less than 5s. per bushel. No better concentrate can be held. Apart from other advantages, the pea is free from the ravages of both weevil and mice.

Some may prefer to feed the grain direct to the sheep. If this is done a good crop should fatten off from fifteen to twenty forward lambs per acre. This again should show an earning value of about £5 per acre. It is, however, risky to feed a large field direct to sheep without divisions. Ripe peas are soon scattered and if rain falls after the sheep have trodden out the peas and before they have eaten them, considerable loss will follow. Moreover, it is dangerous to have sheep on a pea paddock after a soaking rain. The peas are likely to go mouldy and may set up dietetic trouble.

The Effect on the Crop Immediately Following Peas.

While the actual earning value of the pea crop is important, the effect upon the immediately following crop is of equal importance. This effect varies greatly in proportion to the rainfall. If the rainfall is below 18 inches we think it unwise to follow peas with wheat. In this case the rotation is a simple one, viz., fallow-wheat-peas, and back to pasture or fallow. But I would like to stress the fact that my experience has been on 20-inch rainfall country so that I cannot speak of the returns from the lower rainfall. I

should expect that, where the rain was not sufficient to grow a crop well after peas, there the pea crop itself would be somewhat precarious. Nevertheless, many fine crops have been grown on from 14 to 17 inches of rain. Where the rainfall is over 18 inches we expect to harvest an average crop after peas if sound cultural practices are adopted. The Waite Research Institute has some very interesting figures in this regard. Concerning this, Dr. A. E. V. Richardson writes as follows :—

We are testing thirteen series of crops in a rotation experiment. The first year all the wheat crops were treated alike; they were in fallow. The average yield was 38·5 bushels per acre.

In 1926, eight of the wheat plots sown after bare fallow averaged 40·9 bushels, whilst during the same season the three wheat rotations after peas gave 45·7 bushels. This is a very striking difference, but the rainfall during the growing period was 19·01 inches, quite an exceptional year, and no doubt explains the difference as compared with bare fallow.

In 1927, the eight crops of wheat following bare fallow averaged 41·1 bushels, while the three series of wheat crop following peas averaged 42 bushels. The rainfall during the growing period was 15·05 inches, and the spring relatively dry. During the same two years wheat after wheat yielded 26·3 bushels. Thus during the two years that the permanent rotation plots were subjected to the normal crop succession the yields were as follows :—

Wheat after Peas	43·88 bushels
Wheat after Bare Fallow	40·95 ,,
Wheat after wheat	26·3 ,,

In each case every crop in the rotation received 1 cwt. of superphosphate.

The foregoing facts are very enlightening, and, as Dr. Richardson says, "seem to indicate that where the rainfall during the growing period is from 15 to 20 inches peas can follow wheat with entire success."

These results have exceeded my anticipations, chiefly, I take it, because here the weeds have been kept under complete control, whereas on most farms they materially affect the yields. I have had my share of dirty crops after peas, but I am convinced that if certain practices are followed that this rotation can be kept clean, and thus practically ensure success. The rotation I advocate is fallow-wheat-peas-wheat-pasture.

It will be seen, then, that there are three crops in succession, and that two of the three are wheat. If either of the two first crops are dirty with weeds, then it is very probable that the succeeding crops will be dirty also. Hence it is essential to do all in one's power to have all the three crops free from weeds. We hold this can be done by the adoption of the following recognised practices :—

1. Choose the field for the rotation some time ahead, and fallow well.
2. Sow the first wheat crop as late as is safe in order to have germinated the late weeds. Feed this stubble early and burn so as to be free to work over with the first rain.
3. Work over the ground intended for peas after each rain, particularly just before wheat sowing. This will destroy the weeds when young. Sow the peas as soon as possible after the wheat is finished.

4. Clean up the pea stubble early, work up with first rains, work over with each rain, and sow last with an early variety. This, of course, is only putting into practice ordinary good cultural methods. It is quite practicable to the man who has an adequate plant, and farming is no job for the man who has not. We all know that there is a deal of work in making a good fallow, but surely a little extra work in the autumn is well worth while if by so doing we can grow three crops in succession. But do not make the attempt if you are not determined to beat the weeds.

Effect on Fertility.

The matter of the ultimate effect on the fertility of the soil is not easy to establish, but where figures are not available, the general judgment of a keen agricultural community must command respect, especially when it coincides with what we have been led to expect. In South Australia, where farmers have grown peas in large areas for a number of years, the conviction has grown that the paddocks that have carried peas are afterwards more fertile. I have seen the effect quite plainly three years after the peas had been grown.

One year I sowed peas, oats, barley in three plots as a second crop. All three were harvested. The field was then left out to pasture. The next year the paddock was fallowed, and in the following year sown to the one variety of wheat. As this crop developed I could see the division between the peas and the oats from over a mile away. The growth was much more vigorous and healthy. This is in keeping with our general experience. In fact, it looks as if nitrogen is going to play an important part in restoring the "wheat sick" lands. But not only do peas enrich the soil, they also materially improve the physical conditions of the soil. Heavy setting land is always more friable after peas.

Varieties.

For many years the Dun has been almost the only field pea sown on a large scale in South Australia. The variety is well known. It is capable of very heavy yields where the conditions are favourable. The chief faults of this variety are the lateness of podding and the slow ripening. This makes it very vulnerable to hot winds and to the attack of the grub.

Western Australia has cultivated the Brunswick White pea, and it is proving a much hardier and more reliable variety. This pea grows less haulm, has smaller pods, and grain. The flowers and the grains are white. It grows vigorously and pods about two weeks earlier than the Dun. I have used the Brunswick for two years and have great confidence in recommending this variety. Its chief fault seems to be the fact that the pods shatter easily when ripe, hence many peas are lost when harvesting.

Pests.

The worst pest that we have suffered from in South Australia is the grub. We have had attacks more or less severe from time to time, but in 1927 was the worst I have ever known. Generally the grub will reduce the yield by 20 or 30 per cent., but last year it practically took the whole of the crop. I know of men who are used to estimating yields and who expected to reap as many as 1,000 bags of peas, but who, when the grubs had had their fill, found that scarcely a sound pea remained.

I had Duns and Brunswicks sown in the same paddock. The grubs annihilated the Duns, but the Brunswicks yielded comparatively well. I estimated that 25 per cent. of the latter variety were destroyed, but even so they yielded six bags per acre. And these were practically the only peas that escaped the ravages of the grub for many miles around.

The Pea Mite has caused considerable damage in Western Australia, but so far we have been spared this pest. I have, however, seen red-legged mites uncomfortably like the *Penthaleus* destructor of Western Australia.

Time of Sowing.

It is difficult to be definite as to the time of sowing as between one State and another, but, generally, sow the peas as soon as possible after the wheat. Many have spoilt all chance of a good crop by sowing the peas too late. We incline to sow our wheat later and our peas earlier. Hence this year I sowed one paddock of peas while only half-way through the wheat sowing

Certainly the slovenly habit of only ploughing up after the wheat is sown and then sowing the peas does not give this crop a chance. Have the land in good tilth before seeding, and work over just as seeding starts to kill the weeds, then sow immediately after the wheat is in. Many fear the frost, but my experience is that the hot winds are much more to be feared than are the frosts.

Harvesting.

Everybody now knows, thanks to the ingenuity of our agricultural manufacturers, that we can reap peas almost as we can wheat. A pea attachment is now looked upon almost as a necessity on many farms. This attachment will handle and clean ready for market from 50 to 100 bags per day. All that is required is that the land be rolled and be reasonably free from stones. When reaping the Brunswicks the lifters need to be placed a little closer. This is because the haulms are smaller.

If the paddock is fed direct to the sheep, divisions should be run across the paddock, and the first division should be stocked early before the peas are ripe. This gives the stock a chance to eat much of the grain before it sheds.

Rationing the Grain to Stock.

I have already spoken of the high feeding value of peas. Much more, of course, is derived from this fodder if rationed out, as can be done when they are bagged.

One pound of this grain per day will cause stock that are grazing over dry fields to put on weight at once.

Except when the conditions are very bad, peas can be spread on the grass land with no loss. A ewe-and-lamb flock will thrive on a pea ration. I use this grain for preparing both stud sheep and Shorthorn cattle for the shows.

A ration of 3 lb of crushed pea at each milking will soon put a cow that is on a maintenance ration up to her limit. Horses do not take to crushed peas at once, but when once they do so they will work excellently on the ration.

There is no better feed for pigs, especially when the milk supply is low. If milk is plentiful it is cheaper to feed on a grain less rich in protein.

Many folk have never realised the advantage of keeping an adequate store of concentrates on the farm. They add to the income all round if wisely used.

Summary.

The history of agriculture is full of warnings of the folly of robbing the fertility of the soil. When once this has been done it is no simple matter to build up the fertility again. The adoption of pea-growing in rotation with wheat will enable the farmer to safeguard this essential point, and will at the same time prove a remunerative crop of itself. At the same time it will not reduce the acreage under wheat. Where the conditions are suitable, one-third of the wheat may go in after peas and two-thirds after bare fallow. You need not sow an acre less wheat because you sow the peas. It thus enables the fertility of the soil to be maintained, and still grow adequate acres to wheat. At the same time it provides an excellent source of fodder supply.

Points to Remember.

1. Do not attempt this rotation if you are not prepared to deal with the weeds. Good farming is important when growing wheat after fallow; it is essential when growing wheat in rotation.
2. The facts I have given refer to a rainfall of 18 inches or more.
3. Risk sowing too early rather than too late.
4. The Brunswick White pea seems the most suitable for the typical wheat lands.

INFECTIOUS DISEASES REPORTED IN AUGUST.

THE following outbreaks of the more important infectious diseases were reported during the month of August, 1928:—

Anthrax	1
Blackleg	6
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia	10
Swine fever	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Propagation Frames for Tomatoes.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

HOT frames and hardening-off frames play a very important part in the propagation of many crops—mainly summer crops—in this State. These structures make it possible for the seeds and plants of vegetable crops to be planted out of season when field conditions are totally unsuited for their germination and growth. By starting summer crops in the winter, they mature much earlier than under natural conditions and thus receive the advantage of the high prices of the earlier markets. Again in late districts (such as the tablelands) where the period between frosts is rather short, long season crops will not mature unless the seedlings have been started in hot frames.

Many people imagine that the purpose for which hot beds are constructed is the forcing of early crops. This is not correct; their proper use is to create a set of conditions, both atmospheric and soil, which corresponds with those of the natural growing season of the plants to be propagated. These conditions allow of the normal, healthy growth and development of the seedlings out of season. Plants can be forced in hot frames, but under these abnormal growing conditions the seedlings become overgrown, sappy and unhealthy, and they are very susceptible to all diseases.

Choosing the Situation.

When a grower is about to construct frames, he should give a good deal of thought to the situation, as this largely governs the amount of labour necessary in working the beds, and also contributes considerably to the success or failure of the venture. In the first place the frames should be located in a position with a northerly aspect, to obtain the maximum amount of sunlight. If possible, a well drained piece of soil in close proximity to the water supply and manure heaps should be selected, and full advantage should always be taken of any windbreaks or buildings, as protection from southerly and westerly winds.

Before starting the construction of any type of hot frame, attention should be given to surface drainage; suitable conditions in this regard can nearly always be obtained by digging open drains.

The Various Types of Hot Beds.

Hot beds actually consist of a well prepared seed-bed enclosed in a frame of some description, covered with either a sash of glass or some easily adjustable material, and the whole artificially heated. The heat is usually obtained by the fermentation of organic matter, of which the most common form is fresh horse or poultry manure. Suitable substitutes, such as a mixture of green leafy crops and manure, are sometimes used. The supply of organic

manure in sufficient quantities has become very unreliable in parts of New South Wales, and growers of early tomatoes on a large scale are seeking something more dependable. Several growers have constructed beds of their own design and supplied the heat through various agencies. The Department received several requests for information on this type of seed-bed last winter; and the particulars, given later, of a fire-heated frame which has been used with success at Bathurst Experiment Farm, should be of interest.

Frames Heated by Fermentation.

The heating material used in this class of frame usually consists of fresh animal manure, or a mixture of animal manure and vegetable matter. The most satisfactory materials are fresh horse or poultry manure. Farmers are beginning to realise the manurial value of the latter and in certain districts its cash value is too high for it to be used as heating material.

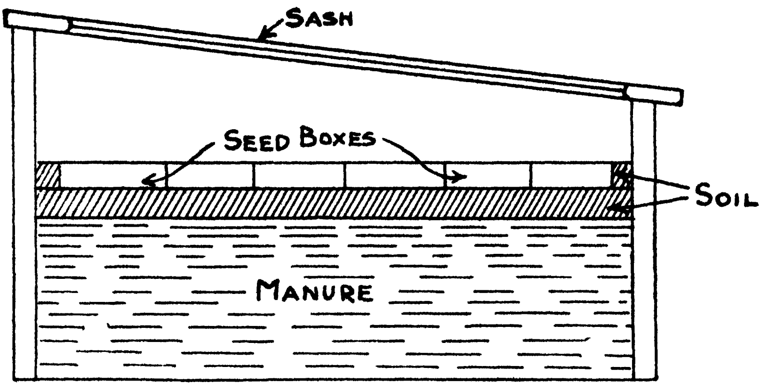


Fig. 1. Section of a Frame Heated by Fermentation.

To obtain the best results with horse manure, it should be piled in a large heap about two weeks before being transferred to the frames. This heaping encourages uniform fermentation and heating. Before it is placed in the frames the mánure should be turned over into another heap, and if dry, damped with a little water. Under no circumstances should the manure be over-wet, as this prevents the material from fermenting. The manure heap should at all times be protected from rain. The best results will be obtained if only a small amount of manure is placed in the frame at a time, and then thoroughly trampled. The trampling prevents uneven heating and also any danger of the bed sinking later on. The addition of straw bedding to horse manure, increases the bulk and encourages rapid fermentation. When using substitutes for horse manure, it must be remembered that the material must not be too wet or too dry, and that when placed in the frame it must be thoroughly compacted.

After the manure is placed in the frame it will set up a high temperature that will probably destroy any seeds; it will therefore be necessary to wait until the temperature recedes to about 85 degrees Fahrenheit. The soil

in which to plant the seedlings should be prepared, and an endeavour made to produce an open mixture with plenty of organic matter. This can be obtained by mixing equal parts of loam, sand, and decayed leaf mould or rotted organic manure. A very small amount of superphosphate can be added. It is usually advisable to place a layer of about 6 inches of soil immediately over the manure. The seed can be sown in rows direct in this soil or placed in shallow boxes above the soil layer. When boxes are used only 3 inches of soil are used to cover the manure.

Fig. 2.—A Hot-air Heated Frame.

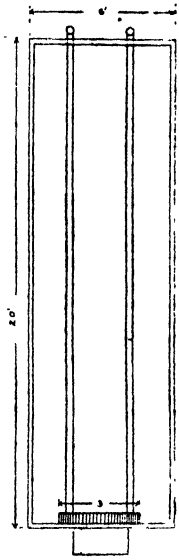


Fig. 3.- Plan of Hot-air Heated Frame.

This type of frame has been used with success at Bathurst Experiment Farm.

The usual type of hot frame is illustrated in Fig. 1. They are usually temporary structures and can be shifted each year. The covering is made movable to allow of convenient working, and also ventilation. Glass is sometimes used in the coverings, although a most serviceable substitute is oiled calico.

Hot-air Frames.

Practically all the frames, other than those deriving their heat from the fermentation of organic manure, are hot-air frames. The chief advantages these frames have over the old types are that control of temperature and humidity is obtained, that owing to the absence of organic matter the danger of insect pests and diseases is reduced to a minimum, and that once the bed is established the grower has no expenses in connection with it until renewals are necessary. With the old type of frame a good deal of expense is necessary each year in obtaining new heating material, &c., and thoroughly sterilising the frames after each season.

Figs. 2 and 3 give some idea of a handy and easily-constructed hot-air frame, which can be made of wood, brick, or concrete, so long as there are no cracks. The hot-air pipes, which are about 4 inches in diameter, may be of any fireproof material or can be replaced by brick flues. These pipes conduct hot air and fumes from a small coal fire under the seed-beds to the chimney, as shown in fig. 3. The fumes first go into a chamber 3 feet by 9 inches against the inside of the seed-bed, so that the pipes do not come into contact with the fire. The covering usually consists of glass sashes, usually about 6 ft. by 3 ft., and so constructed that they can be taken off. It is necessary to cover the pipes with sand in order to hold the heat, and either well-prepared soil or seed-boxes are placed above this sand. The fire pit is about 2 feet deep, and usually contains a small fire grate.

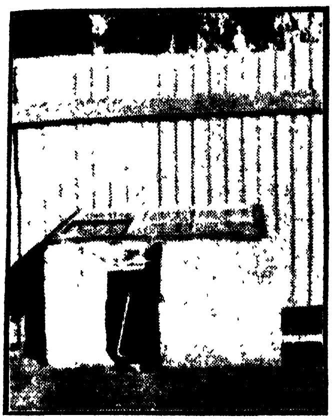


Fig. 4.—A Hurricane-lamp Heater used by Mr. H. P. Evans, "Pevensey," Hay.

In the working of this type of frame it must always be borne in mind that overheating is fatal; if in doubt, therefore, always under-heat. Apply the heat slowly for a few days before planting the seed, in order to allow the heat to penetrate thoroughly and settle down to the required temperature. By using a thermometer over this period the grower will be able to note the variation in temperature and gain experience of this type of frame.

The type of material used in the construction of the frames and the insulating material around the pipes, &c., are factors which must be borne in mind when controlling heat. Outside conditions should always be considered. Under average conditions prevailing in New South Wales it is found unnecessary to apply heat during the day, except when very cold windy weather is experienced. During mild weather very little heat should be applied, even at night. Small smouldering fires, which can be banked at night, should always be used. Large fires alter the temperature too rapidly and shock the plants, while there is also the danger of overheating with large fires. It is found that a frame 20 feet by 6 feet only requires between 7 to 10 lb. of coal per night to maintain the correct temperature.

Small Types of Hot Frames.

A type of hot frame suitable for a small home garden, used by Mr. H. Evans, of Pevensey Station, Hay, is illustrated in fig. 4. Mr. Evans described the frame as follows:—"Inside measurements, 28 inches by 24 inches by 18 inches high, with an additional row of bricks at the back to give the glass sash a slope, and leave the top sides a little open for ventilation. At the front is an opening 8 inches wide from top to bottom for ventilation purposes,

and also to enable the hurricane lamp to be withdrawn. Two bricks from the top I have four iron bars running right across inside to carry the seed-boxes. The top is covered with a glazed sash, 27 inches by 24 inches. This arrangement provides for four seed-boxes. The heat is provided by a hurricane lamp, and in practice the wick is turned about half up, though this can be regulated at will. The ventilation opening is usually loosely covered with wood, and the whole covered with bags at night. The lamp is extinguished in the day time. It is, of course, placed underneath the seed-boxes. Very little kerosene is used."

Many small types of hot frames similar in principle to this one have come under notice at one time or other. Their success depends almost entirely on the grower's experience and the regulation of the heat.

Working the Hot Beds.

Many growers are at a loss as to the right time to plant the seed and get the hot frames into operation, and many errors are made when the plants are in the seedling stages. As no two seasons are the same, it is recommended that commercial growers have two or three frames, and plant each one at an interval of about ten days. Another advantage of this system is that it spreads the work out over a longer period, and thus enables the grower to more economically and efficiently handle a larger area. It is also found that, by having several plantings, the mistakes made in the early plantings can be rectified or avoided in the later beds.

Normally the seed should be planted in the frames about eight weeks before the usual time of planting in the field. As pointed out previously, all seasons differ, but by having seedlings at various stages of growth, advantage can always be taken of an early spring.

Growers should always bear in mind that it takes some time to prepare the beds, hence it is necessary to start work a few weeks before seeding time in order to have everything ready for planting at the correct time.

Seeding.

Under no circumstances should seeding take place until the temperature is about 85 deg. Fah. in the frames. With frames having the heat supplied by organic matter it will be found that in most cases the temperature gets very much higher than this, and it is therefore necessary to wait a day or two to allow the frame to cool off. With hot-air or hot-water frames it will be found advantageous to apply the heat a few days beforehand to enable the beds to warm up. The seed can be sown in soil immediately over the heating portion of the frame or in boxes, as shown in fig. 1. In all cases where time will allow sow the seed sparingly in rows 1½ inch apart, having the rows running from the front to the back of the frame. The seed is covered to a depth of ¼ inch to ½ inch, using a specially prepared mixture of leaf mould or decayed organic manure mixed with a little sand. It will be an advantage to sterilise this dressing with steam or dry heat before use to destroy weed seeds, insects

and disease spores. After planting the seed, the bed should be made perfectly level to prevent uneven watering or washing of the soil, and all cracks filled up to prevent loss of heat, &c. The bed can be watered with a very fine rose spray immediately after planting. In some cases it is covered with hessian and watering takes place through this material, which prevents washing of the soil and also evaporation. This covering should only be allowed to remain on the bed for a period of two or three days, or until the first sign of germination is noticed. If left on even one day too long a weak lot of seedlings is usually produced.

Fig. 5.—A Method used by Chinese for Raising Tomato Seedlings.

Control of Heat and Ventilation.

These two essential factors are more or less connected in certain respects. Heat derived from hot air or water can be controlled by adjusting the fire, &c. The control over the fire depends on the type of firebox or grate, or the method of deriving the heat. Where an oil burner is used it is only a matter of adjusting the flame, but in the case of fires, it should always be borne in mind that a small smouldering fire is desirable. The size of the fire largely governs the heat, although a sliding door or damper can be adjusted to give greater command.

With frames deriving their heat from organic manure no control of the heat-producing material is possible once the beds are complete, but the temperature surrounding the seedlings can be regulated to some extent by ventilation. Ventilation is controlled by raising the sash or covering, and demands a good deal of attention. When the outside conditions are warm the covering can be raised; under good Australian conditions it can be

completely removed for the greater part of fine days. During cold, bleak, rainy weather the covering can be left down, unless the air in the frame is stale, in which case the sash should be only slightly raised for a short period. In the early stages of growth aim at having the temperature of the frames between 75 and 85 deg. Fah. When providing ventilation it should be borne in mind that draughts are to be avoided, as they keep the plants in motion, cause sudden changes in temperatures, and hold up the growth of the plants.

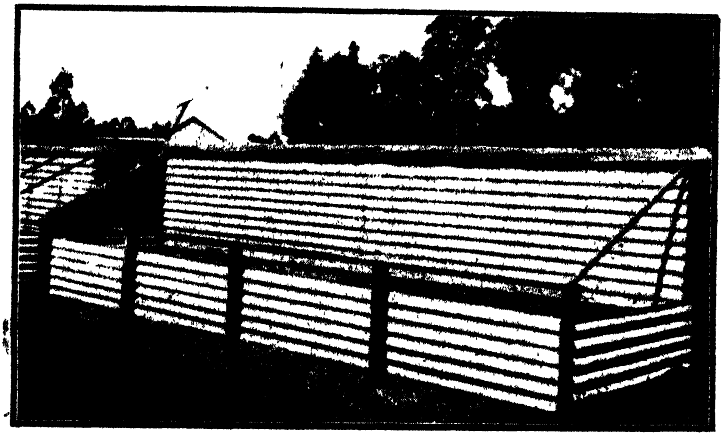


Fig. 6.- A Type of Hot Frame used successfully by Mr. A. E. Johnson at Hoxton Park. This allows maximum sunlight and facilitates weeding and working operations.

Watering.

Water is most essential to the growth of all seedlings, but the amount supplied and the method of applying it govern to a large degree the success or failure of the operation. Ample water must always be given, but care must be taken to prevent over-watering. A very fine rose should be used when applying the water, and every endeavour made to prevent the puddling of the soil. It is always better to give a thorough watering when necessary, than frequent light ones, which seldom soak into the soil to the root system, increase evaporation of soil moisture, lower the temperature of the frame, and increase the number of shocks the seedlings receive. Over-watering, on the other hand, often waterlogs the soil, and increases diseases, particularly "damping off," while the excess water running into the manure stops fermentation and reduces the temperature. After transplanting the seedlings to the cold frames it will be found that considerably more water is required. Watering should always be carried out in the morning, as this allows the soil to warm up during the day. In exceptionally cold situations it will always be advisable to add a little warm water, as very cold water causes a considerable shock to the warm plants.

Care of the Seedlings.

After a successful germination, and after the tomato seedlings have reached about 1½ inch in height, they should be thinned out in the rows to at least

1½ inch apart. This gives the plants ample room to develop sturdy roots and leaves and prevents their running too high. Thinning out also allows good circulation of air between the plants. All weeds should be removed during all stages of growth. In the hot bed, with its high humidity, there is always danger of late blight developing. This can be prevented by spraying with Bordeaux mixture. In the case of seedlings a very weak spray (1–1–20) is used, as a stronger mixture may injure the foliage at this young stage. Spray injury may also be caused by the spray having an acid reaction. This can be tested by blue litmus paper, and the defect can be corrected by adding more lime. Next to blight, the most important disease to combat is spotted wilt. Tests have proved that most probably this disease is carried by insects such as thrips and aphides. Any diseased plants should be destroyed, and regular spraying with a nicotine solution is recommended to control the insects. Other contact killers, such as soap and kerosene emulsion, can also be used for this purpose.

Transplantation.

It is the usual practice to transplant the seedlings from the hot frames into cold frames before finally transplanting to the field. The purpose is to give the seedlings more room in the cold frame to enable them to be successfully hardened off. The seedlings can be transplanted into boxes, pots, or any convenient receptacle. With pots or any other small article into which one seedling is placed, special care should be given to the insulation, or filling up of the spaces between the pots. Frequent failures are caused by the rapid drying out of the pots because these spaces are left unfilled. Boxes should only be made about 12 inches by 12 inches, or a convenient size, and be only 3 inches deep. Holes should always be provided to allow good drainage. The seedlings should be planted into these boxes on the square system, the rows being 3 inches by 3 inches apart. Any broken, weak, or diseased plants should be discarded, and only the healthiest ones transplanted into the cold frames.

No heat of any description is necessary in the cold frames. The precautions to be observed in the construction are to allow for ample sunshine, and at the same time prevent draughts and provide against any crevices that allow the cold air to enter. The boxes on being placed in the cold frames should be insulated all round with soil to prevent their drying out. The function of the cold frame is to harden the plants to outside conditions, at the same time retaining sufficient protection to pervent complete loss by frosts, &c. The hardening-off process should be a gradual one. The plants, having more room in the cold frames, are able to develop a substantial root system and also build more hardened tissues on the stem. The system of hardening off actually consists of increasing the amount of ventilation, and decreasing the number of waterings. During the last week in the cold frame it may be advisable to allow a certain amount of ventilation on cloudy nights when there is no danger of frost.

Grade Herd Testing Records.

How They May be Applied.

R. M. MARSH, Assistant Dairy Instructor.

THE application by the farmer of the results or records obtained through herd testing is one of the main principles on which the effectiveness of herd testing depends, as failure to apply the information gained will necessarily interfere with the ultimate aims and objects of testing, which, briefly, are to breed higher producers and gradually eliminate the unprofitable cows, thus reducing the cost of production, increasing production per acre, and incidentally the annual income.

Many farmers who have taken up herd testing have failed to derive from it the benefits they should have done through lack of a complete understanding of the application of their cows' test records. In order to do this it is, of course, necessary to test over a period of years and systematically use the results. The farmer who makes herd testing a necessary and permanent adjunct to dairying will prove its worth more and more as each year passes.

Summarising the Records.

In compiling a summary of the test records of a herd for a period of twelve months, the following suggestions may be found useful to those dairy farmers who have had their cows tested for milk and butter-fat production under the Department of Agriculture's Grade Herd Testing Scheme. Some of the interesting features revealed by such a summary are:—(1) The average of butter-fat per selected cow, (2) the higher producers from which heifer calves may be reared, and (3) the lower producers which should be culled when the opportunity presents itself. The two latter features are used in a broad sense, since in addition to production, breed type and constitution should be taken into consideration when selecting the breeders; and, on the other hand, drastic culling is not always advisable, especially if the farmer is not overstocked, and would have to purchase cattle to replenish his herd.

As the name implies, the scheme mainly deals with grade cattle. If the cows are grouped in their respective ranges of production, the owner can use his own discretion as to what further action he takes, and will be able to apply the information disclosed by the summary in a very general and practical way. In the first instance, it is necessary to have the records of each cow readily available as soon as the last test for the year has been made, and for this purpose a small book should be procured and each page ruled off in the manner shown below; the weights of milk, percentage or fat test, and the weight (in pounds) of fat for each sub-period of thirty

days being extracted from the tester's record sheet and entered therein. In this way the progress of each cow is brought constantly under the farmer's notice.

TABLE showing a Handy Method of Keeping Records.

Month.	Cow No. 1, Alice.			Cow No. 2, Belle.		
	Milk.	Test.	Fat.	Milk.	Test.	Fat.
	lb.	per cent.	lb.	lb.	per cent.	lb.
October	1,095	3·3	36·	900	3·7	33·
November	945	3 3	31·2	870	3·9	33·9
December	780	3·2	24·9	765	4·4	33·6
January	915	3·5	32·1	765	4·	30·6
February	720	3·6	25·8	750	4·4	33·
March...	510	4·1	21·	405	5·1	20·7
April	345	4·	13·8	......	Dry.	......
May	75	4·3	3·3	......	Dry.	.....
June	......	Dry.	.....	......	Dry.	.....
July	.....	Dry.	...	930	3 8	35·4
August	.....	Calved.	...	975	3 2	31·2
September	990	3·1	30·6	795	3·1	24·6
Total...	6,375	......	218·7	7,155	......	276·3
Matters that affected the yield						

When the production of the whole herd has been recorded in this way. the next procedure recommended is to ascertain the average production of cows with a milking period of not less than seven months, and thus a standard may be set commensurate with the condition and treatment of the portion of the herd during the period under review.

How to Ascertain Production Averages.

There are several ways that can be taken to arrive at the production averages of dairy cows. There is the whole milking herd average, which, officially and generally, is taken to be the total number of milking cows passing through the bails during one continuous period of twelve months, divided into their aggregate milk and butter-fat yields given in the same period. This is called the "herd average." There is the average production of a portion of the whole herd selected on specified and uniform lines, such as (1) those having a continuous or broken lactation of seven months or more in any given continuous period of twelve months, and (2) those having a prescribed lactation period, but excluding any heifer on its first calf. There are other standards that can be taken for selection purposes. Such records are termed "selected" or "part herd averages," and serve a purpose quite distinct from that of the full herd average.

For the purposes of this article, the recommendation and the argument in connection with production averages are made in respect of that section of all cows and heifers milked in a herd and recorded for periods of seven

months and over. Cows showing a milking period of shorter duration should be treated separately, and not included with those dealt with in such summary. Eliminate also cows culled or otherwise disposed of.

Getting back now to the table on page 758, as further reference to the figures shown therein will have to be made at a later stage, each cow's number should be placed in front of her yield, as follows:—

Group Class.	Cow No.	Fat.	Group Class.	Cow No.	Fat.
		lb.			lb.
B	1	218·7	C	39	181·5
A	2	276·3	C	40	159·9
B	3	236·1	D	43	127·8
A	4	275·4	D	44	142·8

When this has been completed, add together the pounds of fat and divide by the number of selected cows, the result being the average production for those cows with a lactation period of not less than seven months.

The total number of cows in the herd in this case was forty-five. Five cows were culled during the year, and, therefore, their production was not taken into consideration when making up this special average. The forty remaining cows showed a total production of 8,008 lb. fat, which divided by 40, gives 200.2 lb. fat per cow. Now, from this average of 200.2 lb. per cow, we expect to find some cows which have produced 250 lb. or more. Setting this as a standard of cows for breeding purposes, or from which heifer calves may be reared (provided a pure-bred production strain bull was used), such cows can be marked off on the list as shown above and placed in group A. Next, mark all cows with production records of 200 lb. up to 249 lb., and place these in group B—further breeders may be selected from the better producers in this group. The next group (C) would range from 199 lb. down to 150 lb. Cows showing production within this range, providing their condition as a producing unit is satisfactory, can remain in the herd and undergo further testing until the herd has been improved to a higher average production. The last group (D) is comprised of those cows showing a production of less than 150 lb. of butter-fat. In regard to this group, special attention is first directed to the reason for such low production, and after having come to a decision in each case the unprofitable cows are located, and they should be culled as soon as an opportunity presents itself.

A summary of these operations can now be set out at the back of the book in which the records have been entered, so that it will be readily available for the main objects for which it was prepared, namely, breeding and culling.

Summary of Herd Testing Results.

[1st *October*, 1926, *to* 30th *September*, 1927.]

Forty-five cows submitted for test; five cows disposed of during year.

Forty cows selected with milking period of seven months or more, tabulated.

Average of forty selected cows is 200.2 lb. butter-fat each.

Group.		Cow's Number.
Class.	Standard.	
	lb. fat.	
A	250 and over	2, 4, 7, 17, 21, 33.
B	200–249 ...	1, 3, 5, 8, 9, 12, 13, 14, 15, 16, 18, 20, 30, 36.
C	150–199 ...	10, 19, 23, 25, 28, 31, 34, 35, 38, 39, 40, 42, 45.
D	Under 150 ...	24, 26, 32, 37, 41, 43, 44.

It will be seen from the above grouping of the herd that six cows produced upwards of 250 lb. of butter-fat, and since it is a comparatively small herd, it is probable that the owner could not rear more than five or six heifer calves each year. With calves of 50 per cent. of each sex, three may be reared from the cows in group A and two or three from the higher producers in group B, taking into consideration at the same time the question as to whether the breed, type, and constitution of each are satisfactory. The remainder of the cows in group B and those in group C should be allowed to remain in the herd, providing they are breeding and otherwise sound.

The records of the seven cows in group D should be dealt with separately with a view to culling. As an instance, it was found that cow No. 24 had a production of only 4,095 lb. of milk of a 3.3 per cent. average test, making 135.9 lb. butter-fat in eight months. This cow consistently tested from 3.1 to 3.3 per cent. for six months, the first and last tests being 3.8 per cent. and 3.6 per cent., respectively. As the fat content in milk is based on heredity, there would not occur any great variation in the average test from one year to another. The milk yield may be influenced to some extent according to the feed and condition of the cow, but if such a cow as No. 24 was in good condition, it can be safely assumed that she is a "boarder," and should give place to a heifer bred from one of the selected higher producing cows in the herd. Cows Nos. 26, 32, and 37 show similar results to No. 24, and Nos. 41, 43, and 44 are cows with a straight-out lactation period of only seven months, being "dry" for five months of the year. Cows such as the latter are a drag on the rest of the herd, and are eating feed which should be returning a profit, and the sooner they are disposed of the better.

Further Points for Consideration.

It might be mentioned that no heifers in this herd were milked during the period reviewed, but the record of heifers on their first calf should be treated apart from the older cows in the herd; and where a large number has been milked, the same procedure may be adopted by grouping them according to their average production.

In conclusion, a word might be said of the herd sire, since any attempt at herd improvement will be greatly impeded unless proper consideration is given to this phase of the question; therefore, to secure a pure-bred bull

of good breed-type and constitution, and of known high production strain, should be the aim of every farmer who aspires to the breeding of a high butter-fat producing herd.

It might also be mentioned that the foregoing method of summarising the year's testing operations was put into practice last year by some of the testers of sub-units in the Tweed-Richmond district of this State, and it was gratifying to note the stimulating effect on the herd-testing movement in these areas, as evidenced by the number of herds resubmitted for test and the additional herds entered in the same areas. As previously suggested, the testing member who studies, dissects, and applies his records in this or a similar way, will the more readily understand and appreciate the valuable information to be obtained by herd testing, as he places himself in a position to check the results and progress attained as each year passes.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
J. L. W. Barton, Wallerawang	16	11 Oct., 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	19 „ 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 „ 1928
Department of Education, Hurlstone Agricultural High School	33	10 „ 1928
Department of Education, Eastwood Home	16	16 „ 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 „ 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 „ 1928
Lunacy Department, Callan Park Mental Hospital	20	26 „ 1928
Miss Brennan, Arrankamp, Bowral	24	29 „ 1928
Mr. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 „ 1929
New England Girls' Grammar School, Armidale	17	12 „ 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 „ 1929
Lunacy Department, Kenmore Mental Hospital	99	17 „ 1929
Tudor House School, Moss Vale	6	22 „ 1929
Lunacy Department, Orange Mental Hospital	3	22 „ 1929
William Thompson Masonic School, Baulkham Hills	29	23 „ 1929
Australian Missionary College, Cooranbong	57	24 „ 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 „ 1929
P. F. Mooney, Calala	33	16 „ 1929
Department of Education, Gosford Farm Homes	16	16 „ 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 June, 1929
Dominican Convent, Moss Vale	4	26 „ 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patricks College, Goulburn	8	26 „ 1929
Presbyterian Ladies College, Goulburn	1	26 „ 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 „ 1929
Department of Education, Mittagong Farm Homes	29	23 „ 1929
Blessed Chanel's Seminary, Mittagong	4	25 „ 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 „ 1929
Walaroi College, Orange	5	30 „ 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	114	5 Sept., 1929

—MAX HENRY, Chief Veterinary Surgeon.

Farm Forestry.

V.—The Native and Introduced Trees of New South Wales.

[Continued from page 626.]

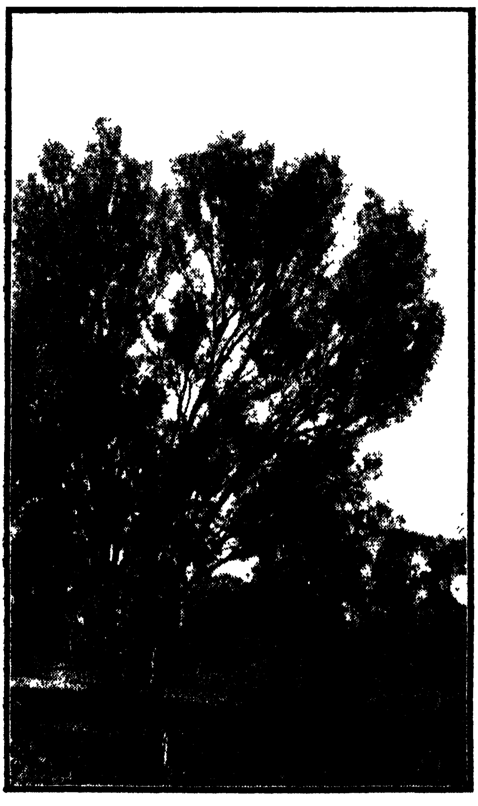
R. H. ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

Principal Native Trees of the Western Plains—*continued.*

The various species of *Acacia* constitute an important element in the tree flora of the Western Plains, and include several species of great value to the pastoralist.

Mulga (*Acacia aneura*).

A small tree, commonly found on rather heavy soils on flats subject to floodings, but may also occur on gravelly ridges and on red, shallow, stony soils.



Mulga (*Acacia aneura*).

Leaves variable, from almost cylindrical to narrow-lanceolate, straight or curved, 1½ to 3 inches long. Flowers in cylindrical spikes. Pod broad, flat, and short.

Uses.—This species is one of the best fodder trees in the west, and is used extensively for this purpose. The timber is durable, and makes good fencing posts. Although not highly regarded as a fuel, it is frequently burnt for charcoal. When grown in clumps it provides useful shelter.

Myall or Boree (*Acacia pendula*).

A small tree with pendulous branches, typically found on rich alluvial, heavy clay, or black soils with good ground water, and is usually regarded as a sign of good land. In the Riverina and south-western districts it is more commonly known as Boree, but is generally called Myall in other western localities.

Leaves narrow, 2 to 3 inches long, mostly curved. Flowers in small heads arranged in short axillary racemes. Pods flat, often slightly curved, about ½ inch wide.

Uses.—It furnishes useful fodder, and in many parts is fast becoming exterminated, sheep eating down the young plants, although horses do not appear to touch them to the same extent. It is a shapely, ornamental tree, and provides good shade and shelter. The timber is of fairly good quality, and is much sought after for fuel, burning well and with a very agreeable fragrance.

COOBA OR NATIVE WILLOW (*Acacia salicina*).

A tree of drooping habit, with a fairly wide range, but generally associated with river country.

Leaves thick, narrow, 2 to 5 inches long Flowers in globular heads arranged in short racemes, or reduced to two or three heads on rather slender stalks, Pods straight, usually constricted between the seeds.

Uses.—It is an ornamental tree, and provides good shade and shelter. The leaves are eaten by stock to some extent. The timber is sometimes used for cabinet and wheelwrights' work. Some varieties of the species are more shrub-like and too small for general usefulness.

Wilga (*Geijera parviflora*).
See *Agricultural Gazette*, August, 1928, page 618, for a description of this tree.

BRIGALOW (*Acacia harpophylla*).

A small to medium-sized tree, frequently forming a dense scrub, and makes clearing difficult. It is mainly confined to the northern part of the Western Plains division, but extends some distance to the south.

Leaves curved, 6 to 8 inches long, with a blue-grey silvery sheen, which gives the tree its characteristic appearance. Flowers in heads on slender stalks, the stalks clustered. Pod narrow, 1½ to 2½ inches long, often curved.

Uses.—This species is frequently regarded as a pest, owing to its habit of forming dense scrubs. Well-grown trees are ornamental. During famine periods it is sometimes eaten by stock, but is not a good fodder tree. The wood, although fairly strong, is not very durable, but makes good fuel.

IRONWOOD (*Acacia excelsa*).

Often one of the largest trees on the Western Plains, but also of moderate size.

Leaves 2 to 3 inches long, curved. Flowers in heads, solitary or clustered. Pod straight, flat.

Uses.—It makes a fine shade and shelter tree, especially when lopped, and is of value as a drought fodder. It is apt to cause impaction if fed too liberally or by itself, but younger growth, if fed sparingly, is of value. The timber is hard, close-grained, of dark-reddish colour, and with a beautiful figure. It is difficult to chop, but does not seem to be very durable for outside work. A useful firewood.

CURRAWONG (*Acacia doratoxylon*).

A small to medium-sized tree, usually growing on hills and ridges, but apparently without preference for any particular soil.

Leaves slightly curved, narrow, 4 to 8 inches long. Flowers in short, cylindrical spikes. Pod somewhat rounded, slightly constricted between the seeds.

Uses.—It is an attractive ornamental tree, the leaves being sometimes eaten by stock. It has been shown, however, to contain cyanogenetic glucosides, which may give rise to prussic acid poisoning.

Group of Yarran (*Acacia homalophylla*).

RIVER COOBA (*Acacia stenophylla*).

A medium-sized tree, usually found along rivers and watercourses, often in company with the Red Gum (*Eucalyptus rostrata*), and is fairly common on parts of the banks of the Lachlan and Bogan Rivers. It appears to prefer basic to siliceous soils, and is not common along creeks in sandy areas. It is occasionally known as "Gurley" or "Eumung," names which, however, are also applied to other species of *Acacia*.

Uses.—It is an ornamental tree, and provides good shelter.

YARRAN (*Acacia homalophylla*).

A small to medium-sized tree, fairly widely distributed, occurring on slate and schist formations as well as on red soil plains.

Leaves greyish, narrow, 1½ to 3 inches long, mostly curved. Flower heads in short axillary racemes or reduced to a single head. Pod narrow, slightly curved.

Uses.—This tree is of little use as a fodder, although cattle are said to eat the foliage. The timber is used for fencing posts and rough work, in addition to certain kinds of cabinet work. It is one of the best western firewoods.

GIDGEE (*Acacia Cambagei*).

A small to medium-sized tree, usually larger than the Yarran and more umbrageous. It is one of the best known of the north-western trees, having a fairly wide distribution, chiefly on sandy or loamy soils.

Leaves up to 5 inches long. Flowers in heads on slender stalks in clusters of about six. Pod flat, straight, about 3 inches long.

Uses.—It furnishes a durable, hard, dark-coloured wood, which is used for fence posts, etc. Stockwhip handles are commonly made from its timber, and specially grained specimens, known as "Ringed Gidgee," are used for making small ornamental articles. The foliage has a distinctly disagreeable odour, which is particularly noticeable on the approach of wet weather. Stock do not appear to touch it.

MILJEE OR UMBRELLA BUSH (*Acacia Oswaldii*).

A small tree or shrub, fairly widely distributed, but usually on red soils.

Leaves rigid, narrow, 1½ to 2 inches long. Flowers in heads, solitary, or in pairs or clusters. Pods flat, narrow, much curved or twisted.

Uses.—It makes a fair shade tree, and, although not very edible, produces an abundance of pods which are said to be eaten by stock. Its slender stems are sometimes used for stockwhip handles.

WESTERN SILVER WATTLE OR GOLDEN WATTLE (*Acacia decora*).

A small tree or shrub, preferring slightly elevated land. It is very often highly ornamental.

Acacia Burkittii.

A shrub usually found on flat ground subject to inundation. Of ornamental appearance.

Eucalypts.

The various species of *Eucalypts* are most conveniently divided into sections according to the character of the bark.

GUMS.

The Gums have smooth bark, with more or less rough or flaky bark at the base of the trunk.

RIVER RED GUM OR MURRAY RED GUM (*Eucalyptus rostrata*).

A medium to large-sized tree, found along most of the western rivers, particularly on alluvial flats subject to inundation, and reaching its best development on silt soils of good depth with a clayey subsoil.

Uses.—Older trees often of crooked growth, but young plants grow rapidly and make fine shade and shelter trees and, if planted fairly closely, good breakwinds. The timber is of moderate usefulness. It is more or less extensively used for making fruit cases in the Deniliquin district. It is sometimes used for fencing, but would be more durable if first treated with some preservative. It is said to make good charcoal. Trees of this species often exude an astringent kino which has medicinal uses. Stock occasionally eat the leaves of one form of the species.

Sapling Growth of River Red Gum (*Eucalyptus rostrata*).

A Gum (*Eucalyptus intertexta*).

A medium to large-sized tree, usually found on drier land, avoiding river country. It is generally recognised by its pale foliage and rather strikingly white limbs. The bark is occasionally smooth nearly to the ground, but at other times the rough, brownish-coloured bark extends for nearly 20 feet up the trunk. Owing to the difference in bark it is known variously as Gum, Yellow Box, Red Box, and Bastard Box.

Uses.—It is a very hardy and drought-resistant species. The timber is red, hard, and rather difficult to split, and therefore frequently used in the round for fence posts. It is not considered by some, however, to be very durable or lasting.

A Gum (*Eucalyptus dealbata*).

This is a variable species in its habit, varying from a Mallee-like growth to a tree of fairly large size. Most commonly, however, it is a small, almost stunted, tree with rather dense glaucous foliage. On account of its small

size and crooked shape it is frequently known as Cabbage Gum. It is also referred to as Red Gum. It is a tree of dry sites, and is usually found growing on hills and ridges of sandstone, slate, quartzite, and igneous formation.

Uses.—Its rather dense foliage makes it useful for shade and shelter purposes, and the somewhat silvery colour of the leaves gives it an ornamental appearance. It is drought and frost hardy. The timber is red, often very faulty, and only of moderate usefulness, being used when better timber is not available.

YAPUNYAH (*Eucalyptus ochrophloia*).

A fair-sized tree with pendulous branches and with rough, scaly, black bark at the base of the trunk. It occurs in the far western portion of the northern subdivision, and is found mainly on low, flat country of black or grey soils. It is most common in the Paroo River district. Also known as Yellow Jacket, owing to the colour of the bark.

Uses.—The timber is said to be very tough, and is used for fencing and certain articles such as buggy shafts.

BOXES.

In the case of Boxes, the trunk, or the greater part of it, is covered with rough bark, the branches being generally smooth.

COOLABAH (*Eucalyptus microtheca*).

A tree often of crooked growth, being small and gnarled, but also reaching a considerable size, with dense and drooping subglaucous foliage. The bark is grey-coloured and rough on the stem, the limbs perfectly smooth and white. It grows only on river and black soil country, being found chiefly in the north on the heaviest black soils which are inundated at certain periods and later dry out and crack. It is also sometimes known as Flooded Box, but this name is better applied to *Eucalyptus bicolor*.

Uses.—The timber is hard, durable and difficult to split, the grain being interlocked. Small trunks and limbs are used a good deal in the round for fence posts, but, owing to its crooked habit of growth, it is often difficult to get decent lengths of timber for other purposes. A good fuel. Useful for shade and shelter. It tends to sucker a good deal, and is often difficult to eradicate from cleared paddocks.

BIMBLE BOX (*Eucalyptus populifolia*).

A fairly common tree, occurring mainly on rather poor, stiff clay soils, which tend to become waterlogged, but is found on a variety of sites. It is a fairly compact and straight growing species. The foliage is thick, shining, and somewhat like the Poplar, giving rise to the adoption of the names Poplar Box and Shiny Leaf Box.

Uses.—When well-grown or lopped it forms an attractive tree, and is useful for shade and shelter. It is often regarded unfavourably by pastoralists, who find it difficult to get rid of when clearing, owing to its

free seeding and suckering habits. The timber is heavy and durable, and is used for fencing and rough work. It is inclined to be faulty and is somewhat difficult to split, and is, therefore, often used in the round for posts, etc.

BLACK OR FLOODED BOX (*Eucalyptus bicolor*).

A small to medium-sized tree, mainly confined to low land subject to inundations, but occasionally extending to drier poorer soils as a small tree. It is widely distributed throughout the division, but mainly in the northern and central subdivisions.

Uses.—Well-grown trees of this species are ornamental and offer good shade and shelter. The timber is hard and very durable, but is not generally favoured, being difficult to split owing to the interlocked grain. It provides good durable posts, etc.

NARROW-LEAF BOX (*Eucalyptus pilligaensis*).

A small to medium-sized tree, found on flats liable to waterlogging. It is confined to the northern subdivision, and to the eastern portion of this, being particularly common on the Pilliga. It is fairly common on red sandy loams or on shallow soils on clay subsoils.

Uses.—The timber appears to be fairly durable for fencing, &c., although the larger trees are sometimes hollow and defective.

YELLOW BOX (*Eucalyptus melliodora*).

This species reaches its best development on the slopes, and is dealt with more fully under that division, but also extends to the plains, where it is generally found near rivers on the edge of dry land. It adjoins the River Red Gum (*Eucalyptus rostrata*), but keeps off the flats.

Uses.—A handsome shade and shelter tree with a good timber, but does not make its optimum growth under the conditions of this division.

Other Boxes occurring in the Plains division include the Fuzzy Box or Apple Box (*Eucalyptus conica*), a species which comes down a little from the slopes, but is not a true plain species, and *Eucalyptus odorata,* a Box of small size or Mallee-like, the timber of which is used at times for fence posts, but is not particularly durable.

IRONBARKS.

The Ironbarks have rough bark, often deeply corrugated.

MUGGA (*Eucalyptus sideroxylon*).

A tree usually found on sedimentary soils, and showing a preference for higher ground. It often occurs on poor shallow soil or sandy ridges, but also grows on deep sandy loams. It is also known as Black or Red Ironbark.

Uses.—The timber is not so valuable as some of the other Ironbarks, but is quite good and durable. At times it forms a rather crooked habit of growth, particularly as it goes west, making it difficult to secure good length timber. When grown from seedlings under cultivation the trees

make fairly good growth, and are ornamental in appearance, but they require to be grown in those parts of the division which enjoy the best conditions.

SILVER-LEAF IRONBARK (*Eucalyptus melanophloia*).

A small to medium sized tree, rarely attaining any great size, and frequently crooked and faulty. It occurs most commonly on good soils of volcanic origin, such as deep loams, but is not limited to such soils, being found on shallow clays or stony soils as well.

Uses.—This species is hardy, is useful for shade and shelter, and the broad blue foliage is rather ornamental. It yields strong and durable fencing posts, and rough constructional timber.

NARROW-LEAF IRONBARK (*Eucalyptus crebra*).

This species is not common in the Western Plains division, but descends from the slopes in parts. It occurs on most soils, but usually on deep, fairly rich types. It is often associated with the White Pine (*Callitris robusta*) on sandy loam country.

Uses.—The timber is one of the finest of the Ironbarks, being very hard, heavy, and durable. It is especially prized for heavy work requiring strong, durable timber.

BLOODWOODS.

CARBEEN OR MORETON BAY ASH (*Eucalyptus tessellaris*).

A rather handsome tree of medium to large size, occurring in the northern subdivision. It is usually found on moderately fertile loams or heavy alluvial soil and is regarded as a sign of good grazing country.

Uses.—The timber is not regarded as being durable in the ground, but is used for other constructional work.

SMOOTH-BARKED BLOODWOOD (*Eucalyptus terminalis*).

A tree often attaining a fairly large size, occurring mainly on poor sandy soil in the northern subdivision, usually on ridges.

Uses.—The timber is regarded as durable and useful for a number of purposes.

BLOODWOOD (*Eucalyptus trachyphloia*).

A small to medium-sized tree found on poor sandy soils towards the eastern boundary of the northern subdivision, but more commonly occurring in the Slopes division. It is confined mainly to the tops and sides of ridges.

Uses.—Timber generally regarded as hard and durable.

MALLEES.

The Mallees are dwarf *Eucalypts*, generally with a large bulbous rootstock, which throws out a clump of comparatively thin stems. Generally speaking, Mallees grow on somewhat elevated land, avoiding river flats, and preferring soils from sedimentary formations, such as sandy or dry, gravelly types.

Occasionally a Mallee might grow into a single-stemmed tree of medium size, and, conversely, species which are usually single-stemmed are sometimes reduced to Mallee-like growth.

The Mallees include a number of different species, the chief of which in the Plains division are *Eucalyptus dumosa, Eucalyptus oleosa, Eucalyptus Morrisii,* and *Eucalyptus gracilis.* Belts of Mallee are extremely useful in providing breakwinds and shelter belts, and as they are generally confined to light soils, their total destruction over large areas has frequently resulted in the formation of soil drift and surface erosion. They also supply fuel and a certain amount of useful timber of small size.

Apples (*Angophora* spp.).

Three of these species are to be found in this division, namely, *Angophora melanoxylon, A. ochrophylla,* and *A. intermedia.* These will be dealt with more fully in the Western Slopes division.

Introduced Trees.

These trees have either been introduced from some other division of the State or are natives of other countries. They do not occur naturally in the division, and are always artificially grown.

PEPPER TREE (*Schinus molle*).

This tree, which is a native of South America, is able to thrive under a big variety of soil and climatic conditions, and has done a great deal towards relieving the bareness and dustiness of western towns. It is very hardy, but robs adjoining soil of moisture, &c., to a considerable extent, and is therefore not suitable for planting close to crops or gardens. It is a good shade and shelter tree, and is of ornamental appearance, although extensive planting has given it the handicap of commonness in many eyes. A hardy and most useful species for this division, but should not be planted to the exclusion of other useful species.

WHITE CEDAR (*Melia azedarach*).

This species is a native of the Coastal division, but has proved very hardy under western conditions. It is fairly fast growing, and does not appear to be particular about soil conditions.

Being deciduous, its usefulness as a shelter tree is confined to the summer season. For summer shading, however, round about sheep-yards, houses, etc., it is a good tree for planting. The berries have caused poisoning in pigs, but are not considered dangerous to other animals, being grown fairly extensively in poultry runs, for example, without any ill-effects. Its deciduous character makes it especially valuable for places like sheep pens and poultry runs, which require shade in summer, but plenty of sunlight during the winter months.

SILKY OAK (*Grevillea robusta*).

Like the White Cedar, this tree is a native of the Coastal division, but does remarkably well when grown artificially in the Western Plains division. It is a useful shade and shelter tree and is very ornamental in appearance, the fern-like leaves being particularly handsome. A good tree for avenue planting. The timber is also valuable, furnishing the well-known commercial "Silky Oak."

SUGAR GUM (*Eucalyptus cladocalyz*).

This tree is a native of South Australia, but has been planted fairly extensively in many parts of this State. It is very adaptable as regards soil, but appears to prefer fairly light soils of good depth. It is quick

White Cedar (*Melia azedarach*)

growing and fairly hardy, but somewhat susceptible to frost injury. Although moderately drought-resistant, it should only be grown in those parts of the division which enjoy the best rainfall, or which command irrigation facilities. It makes fairly heavy demands on soil moisture, robbing adjoining soil to a considerable extent. It stands lopping well, and should not be allowed to run up too quickly, as lopped trees make better growth. On irrigation areas it has done particularly well. Where growth is slow, under dry or other adverse conditions, it is liable to attack by scale insects and other diseases.

The timber is of moderate usefulness and durability, although sappy young poles are generally very inferior. The foliage is sometimes eaten by stock.

TAGASASTE OR TREE LUCERNE (*Cytisus proliferus*).

A shrub or small tree, rarely exceeding 18 feet in height. It is a native of the Canary Islands, but has been grown in many parts of the State, including the Western division. It has a deep-rooting habit, and is moderately drought-resistant. It is fairly commonly grown as a hedge plant, making good dense leaf growth when pruned back. It is also suitable for small windbreaks, or for use in association with taller trees in breaks of the several row type.

It is regarded as being a useful fodder plant, although in some cases stock will not readily eat the foliage. Stock appear to prefer the young growth from pruned plants, and in some cases have to acquire a taste for the plant. A profusion of white flowers are produced, which are useful where bees are kept.

The species has a number of varieties, of which the variety *palmensis* is regarded as the best. (See *Agricultural Gazette of New South Wales*, Vol. 26, p. 883, 1915, for a full description and notes by J. H. Maiden). The seed should be soaked in water before sowing.

Acacia spp.

A number of the Wattles, other than those occurring naturally, have been cultivated with more or less success in many parts of the division. These include *Acacia Baileyana*, *Acacia podalyriaefolia*, and forms of *Acacia decurrens*. Although chiefly grown for ornamental purposes, they provide some shade and shelter, and may be used in breakwind formations. Generally speaking, however, they are only grown successfully where a certain amount of artificial watering is possible.

Miscellaneous.

The Evergreen Oak (*Quercus virginiana*) and the Oriental Plane (*Platanus orientale*) are grown in those parts of the division with the best rainfall. The Plane is deciduous, and is chiefly grown for ornamental purposes and street and avenue planting. The Evergreen Oak requires some watering until established, and is slow growing, but makes a fine shade and shelter tree under moderately good conditions.

The beautiful Jacaranda tree is grown successfully in parts, but requires some protection from frost during the first two or three years.

Willows do well along the banks of streams on the eastern part of the division, and, apart from being useful shelter trees and bank binders, provide good stock feed for drought periods.

The Moreton Bay Fig (*Ficus macrophylla*) and some of the other Figs do fairly well in parts where a supply of water is available.

The Cowitch tree (*Lagunaria Patersoni*) makes good growth in some districts, particularly in the north, and makes a fine shelter and ornamental tree. The fine hairs produced inside the fruit of this species, however, are sometimes a source of irritation.

In the more favoured parts of the division, particularly where irrigation is possible, Elms, Poplars, Almonds, Loquats, and Olive trees do moderately well. In the Deniliquin district, Olive trees make a good show and provide splendid shelter.

The Carob Bean (*Ceratonia siliqua*) is not sufficiently hardy for this division, and can only be grown where special care and watering are available, as in gardens, etc.

The Honey Locust (*Gleditschia triacanthos*) and Osage Orange (*Maclura aurantiaca*) are also grown in some districts, but are not particularly adapted for this division.

The various species of Pines are, generally speaking, not sufficiently hardy and drought-resistant, although in the southern division, *Pinus insignis*, *Pinus halepensis*, and *Pinus canariesis* have been grown with some success. They are, however, not recommended for planting except in isolated cases.

TREES RECOMMENDED FOR THE WESTERN PLAINS.

The following list gives the species recommended for planting for different purposes in this division. All the species mentioned are not suitable for every portion of the division or for all situations, but a reference to the notes previously given on each species will indicate its particular requirements and utility. A selection might then be made to meet the individual requirements of a particular locality:—

Shade and Shelter Trees.

Wilga (*Geijera parviflora*).
Kurrajong (*Brachychiton populneus*).
Pepper (*Schinus molle*).
Silky Oak (*Grevillea robusta*).
White Cedar (*Melia azedarach*). Deciduous.
Myall (*Acacia pendula*).
Gruie (*Owenia acidula*).
Belah (*Casuarina lepidophloia*).
Ironwood (*Acacia excelsa*).
Flooded Box (*Eucalyptus bicolor*).
Gum (*Eucalyptus dealbata*).
Rosewood (*Heterodendron oleafolium*).
River Red Gum (*Eucalyptus rostrata*. In clumps.
Sugar Gum (*Eucalyptus cladocalyx*). In clumps.
Mugga (*Eucalyptus sideroxylon*). In clumps.
Willows (*Salix babylonica*). River banks in eastern portion.
Cooba or Native Willow (*Acacia salicina*). River banks.
Wild Orange (*Capparis Mitchelli*).
Coolabah (*Eucalyptus microtheca*).
Bloodwood (*Eucalyptus terminalis*).
*Evergreen Oak (*Quercus virginiana*).
*Moreton Bay Fig (*Ficus macrophylla*) and other *Ficus* species.
**Lagunaria Patersoni*.
*Olive Tree (*Olea europea*).

* Where rainfall is moderately good and artificial watering is possible.

Windbreaks and Shelter Belts.

Group I—

Wilga (*Geijera parviflora*).
Kurrajong (*Brachychiton populneus*).
Belah (*Casuarina lepidophloia*).
Myall (*Acacia pendula*).
Pepper (*Schinus molle*).
Silky Oak (*Grevillea robusta*).
Tree Lucerne (*Cytisus proliferus*).

Group II—

Sugar Gum (*Eucalyptus cladocalyx*).
Mugga (*Eucalyptus sideroxylon*).
River Red Gum (*Eucalyptus rostrata*).
Flooded Box (*Eucalyptus bicolor*).
Bimble Box (*Eucalyptus populifolia*).

Group I includes shorter growing species, from which the outer rows of two or more rowed breaks may be selected, and Group II represents the taller growing species, from which the inner or central row may be chosen. For example, the following combinations may be made:—Kurrajong and Sugar Gum, Silky Oak and Mugga, Wilga and River Red Gum. Any of the species from either group may be used for a single line break, or a multiple row break of one species.

Fodder Tree Plantations.

Although a number of the western trees provide useful fodder, it is wise to restrict selection to the best species, viz., Kurrajong. In localities where this tree will not do well, plantations may be made of those local trees which make good growth, such as Mulga, Myall, or Supple Jack, as the case may be.

Trees for Timber.

White Pine (*Callitris robusta*). House construction, etc.
River Red Gum (*Eucalyptus rostrata*). General hardwood purposes.
Mugga (*Eucalyptus sideroxylon*). General hardwood purposes.
Flooded Box (*Eucalyptus bicolor*). Fencing and heavy work.
Belah (*Casuarina lepidophloia*). Fencing and general utility.

Trees for Fuel.

The various species of *Acacia*, including Myall (*Acacia pendula*) and Yarran (*Acacia homalophylla*).

The Belah (*Casuarina lepidophloia*) and some of the Eucalyptus species might also be planted.

These lists of recommendations are purely tentative, but are based on an exhaustion of the present state of knowledge. They will be added to or modified as trees prove their adaptability to the exacting conditions of the division.

A fairly large number of the species mentioned cannot be obtained from the ordinary nurseryman, who includes a very limited selection of trees in his list. Where such is the case, plants should be raised from seeds collected from local trees.

(*To be continued.*)

Lucerne and Pasture Improvement at Trangie Experiment Farm.

A. H. MACDOUGALL, Manager, Trangie Experiment Farm.*

THE following article is written with a view to drawing attention to the possibilities of lucerne for pasture purposes in districts previously regarded as unsuitable for lucerne growing—districts of low rainfall under hot, parching conditions—rather than as a record of work carried out in this connection at Trangie Experiment Farm. The results in pasture improvement, chiefly by the culture of lucerne, obtained at this farm are applicable to a vast area of similar country lying between the Macquarie and Bogan Rivers, bounded by the Dubbo to Peak Hill districts on the east and by Warren and Nyngan districts on the west. A further area of suitable land is to be found north of the Macquarie River towards Collie. The soil is light red loam, with a fairly retentive subsoil of drift formation, but through which the lucerne roots penetrate in almost a perpendicular manner. It can also be safely said that there are in addition to these areas many thousands of acres of similar land.

All the districts mentioned may be termed "herbage country," and on this country abundance of feed, such as trefoil, crowfoot and barley grass, is assured during the winter and spring months in average seasons. This herbage becomes dry in October and November. From then on to late autumn in a dry season there is very little natural green feed available for stock. It is to supply such a green fodder ration that pasture improvement, by the growing of lucerne and other grasses, is so necessary, in order that a naturally balanced ration may be maintained throughout the year.

Other Grasses giving Good Results.

Pasture improvement work was first commenced at Trangie Experiment Farm in 1920 by the sowing of 100 acres of lucerne and Rhodes grass at the rate of 2 lb. of each per acre. This area of lucerne is still good pasture. It has had no subsequent cultivation and has had continual grazing. The Rhodes grass failed to germinate with any degree of satisfaction, but the little that did come up was readily consumed by stock and is still to be found in small sections. In the late autumn of 1925 a further area of 100 acres was sown with 2 lb. lucerne per acre. Among other grasses experimented with, Wimmera Rye and Giant Panic have both given good results. Subterranean clover has been planted, but only to demonstrate the superiority of lucerne.

Lucerne has become the foundation for pasture improvement work here. Wimmera Rye grass has done exceedingly well, but, being a winter growing annual is of limited value as a summer pasture. In districts where

*Paper read at Conference of Farm Managers and Agricultural Instructors, Sydney, 1928.

winter herbage plants are not plentiful, the growing of Wimmera Rye is strongly recommended. It appears to be a hardy annual, seeds prolifically, is quick to germinate in early autumn, and from three years' experience of it at Trangie, increases in density each year and is in every way a desirable pasture.

Sow Lucerne in the Autumn.

Autumn sowing of lucerne is recommended. The land is worked with a one-way disc cultivator, and sowing is done with an ordinary wheat drill, through the fertiliser attachment.

The sowing of as low a quantity of lucerne as 2 lb. to the acre may, to those not familiar with the conditions ruling in this district, appear very light, but from the results to be seen at Trangie in the large and vigorous crowns, and the proved increased carrying capacity achieved, one would hardly desire to increase the seeding rate. While lucerne does not grow to any extent during droughty summer periods, it is very quick to respond to summer rain, and even after light falls good fresh pasture is available in two weeks. During the last two years our lucerne pasture has been a wonderful asset to this farm and has provided the major portion of the feed for our young stud rams. It has been stocked very heavily and over the summer months, when lucerne is the only feed available, has carried in good seasons up to four and five sheep per acre; as many as twenty sheep to the acre have been carried for a short period. A further area of 60 acres of pasture was sown in May, 1927, with 2 lb. lucerne and 2 lb. Wimmera Rye per acre. Despite extremely dry conditions, a good stand was obtained. This area is a direct contradiction to the belief that only in exceptionally favourable seasons can a good germination be obtained. The rainfall from May to December was as follows:—May 22 points, June 56 points, July 5 points, August 114 points, September 180 points, October 107 points, November 205 points, December 140 points. Although the winter was dry, the favourable rains from August to December enabled a good stand to be obtained.

During May and June this year a further area of 100 acres was sown with 3 lb. lucerne seed on land which received two disc cultivations immediately following each other. This land had not received any cultivation since 1920, when it was under a wheat crop.

To show the suitability of this light red loam for lucerne growing and to ascertain the root development, a hole 6 feet deep was recently sunk on the edge of several lucerne plants, and at that depth the roots were still as thick as lead pencils, although the plants were only three years old. On another portion, barely twelve months old, the root systems were strong and had reached a depth of nearly two feet. Although sub-artesian water is to be found throughout the whole of this district, the depth is far too great to be available to the plants.

Remember that scrupulous cleanliness is all important at all stages of milk production, and spare no pains in its observance.

Milk Weed (*Euphorbia Drummondii*) Proved Poisonous to Sheep.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.*

THIS is a very common weed throughout the western, southern and north-western areas of this State and commonly goes by the names "milk weed," "caustic creeper," "poison weed," etc. But it is by no means confined to those areas, and is plentiful along the southern railway line in the County of Cumberland, the seed having evidently fallen from passing stock trains. It is probably to be found, therefore, in all parts of the State to which sheep are travelled from western areas. It does not, however, thrive in the coastal districts, and it is apparently only on the southern, western and north-western plains that its growth is at all prolific. During the past autumn it has been especially abundant, and on one property visited by the writer it must have constituted 50 per cent. of the herbage. On that property it was causing no ill effect; the fact that it may commonly be eaten with impunity will be referred to later.

The plant is readily recognised by its creeping habit, the stems, anything up to twenty or thirty in number, spreading over the surface of the ground from a short central stem. Along these branches are the leaves, which are small and oval, and distributed more or less evenly along the stems. The seeds are enclosed in a small three-chambered fruit. The stems may be green, or of a purplish colour, and the leaves may be tinted purple at the edges.

It is well-known to many stockowners, and probably no other plant has been so commonly suspected of being a poisonous one. No doubt in many cases there have been strong circumstantial reasons for suspecting it, but in many cases there have been good grounds for believing that the mortalities complained of have not been due to it. Another feature which would tend to bring it under suspicion is that it belongs to a group of plants which have an acrid milky latex or juice.

A Negative Experiment.

Like many other plants, "milk weed" was "reputed to be poisonous" many years ago, and though the question as to the harmfulness or otherwise of many of these plants has not been determined, so importantly has milk weed figured, that it was natural that it should be one of the first plants submitted to feeding tests. In 1886, therefore, the late Mr. Edward Stanley, Government Veterinarian, undertook feeding experiments on Yanko Station.

* A research undertaken under the Poison Plants Committee of the Commonwealth Council for Scientific and Industrial Research.

Though initially some difficulty was experienced in getting the sheep to take the plant and hand-feeding had to be undertaken, it was later found that the sheep would eat up to a pound of the plant especially if mixed with a little chaff. Mr. Stanley records that over 56 lb. of the weed was consumed by six sheep in six days without the animals showing the slightest ill effect. Decoctions of the plant were administered, with a like result. Mr. Stanley concluded that though there was no doubt that losses of sheep did occur from eating this plant, he considered, in view of his experiments, that such losses were not due to the plant being actually a poisonous one. Deaths were, in his opinion, due to hoven or bloat as a result of hungry sheep gorging themselves with the young succulent plants.

Thus for many years it has been assumed that *Euphorbia Drummondii* (milk weed) is not a poisonous plant. A circumstance which has assisted to continue this assumption has been the fact that in several outbreaks attributed by owners to it, the suspected plant has been found, on identification, not to be milk weed (*Euphorbia Drummondii*), but a plant which resembles it to some extent. Owing to the suspicion attached to this plant persisting so widely, we have regarded the plant as still in the "suspected" class, notwithstanding Stanley's work.

The opinions of botanists in Australia, as given in their books, the agricultural journals, etc., have been somewhat at variance. Thus Bailey (Queensland) states it is very poisonous to sheep; Ewart (Victoria) that it is not poisonous; Osborn (South Australia) regards it with grave suspicion. Maiden, accepting the conclusiveness of Stanley's experiments, states that it is not poisonous though often suspected, and recalls the fact that every year, particularly about March, he got many reports, chiefly from the west, of its devastations. Herbert (Western Australia) states that it is undoubtedly poisonous, experiments on rats, both with fresh and air-dried plant, having shown this.

Some three or four years ago we tested it on a limited scale, and found that with guinea pigs it led to death of the animals at times, but at other times it did not. This seemed to indicate that the toxicity was variable. What the toxic principle was and what were the circumstances that caused the plant to be toxic only at certain times we did not determine. We do not regard tests on small laboratory animals as either satisfactory or definitive, and so set the plant down for testing on sheep at the earliest opportunity (the sheep being said to be poisoned under natural circumstances).

Cleland had noted that the plant contained emulsin, but his tests for a cyanogenetic glucoside were negative. In the experiments recorded by Herbert, the rats given the fresh plant died in about twenty-four hours after eating the plant. With dried plant death took place in a like time after eating the first dose, though actually the animal had another feed only two and a half hours before death. He recalls that plants like sorghum, though cyanogenetic, lose their toxicity on wilting, but evidently does not suspect *Euphorbia Drummondii* of being cyanogenetic. The symptoms

described by him are not those of prussic acid poisoning, nor is the symptom of swelling of the head and neck, recorded by him as occurring in rats, seen in sheep poisoned under natural circumstances.

Summed up, therefore, we may say that the position at the time we undertook our sheep experiments was that—

(1) the plant was strongly suspected by some;
(2) feeding tests by Stanley on sheep had been entirely negative;
(3) tests for prussic acid had been negative;
(4) feeding tests on rats had shown it to be toxic for them, but inducing symptoms not recorded as occurring in sheep and with death more delayed in occurrence;
(5) feeding tests on guinea pigs had shown it to be toxic at times, death then occurring comparatively suddenly and the dead animals showing no gross lesions.

Cases in which Poisoning was Suspected.

The following, which are taken from our records, are typical of the type of mortality which is said to be due to this plant:—

Wilcannia.—February, 1925. A flock of ewes ranging from 4-tooth to full mouth had been brought into the yards for crutching. They were kept in for a day and a night and then turned into the paddock. That afternoon 150 were found dead within a small radius. In this case the weed was well away from watercourses, being situated on a slight rise, and the nearest tank was fully a mile away. Weed suspected was identified as *Euphorbia Drummondii.*

Dunedoo.—April, 1927. Lost several sheep and suspected a weed. Plant submitted was identified as *E. Drummondii.*

Manilla.—February, 1928. A cultivation paddock of 80 acres with 30 acres of black soil at one end. Plant grows only on black soil. Placed 300 sheep in this cultivation, and five days later nine were found dead. Had died without a struggle. Had had thirty head of cattle and fourteen horses in the paddock for a month; none suffered ill effect. Plant forwarded identified as *E. Drummondii.*

Coolah.—January, 1928. Dead sheep found on a patch of the plant. Sheep became affected within twenty-four hours of placing in the paddock. No symptoms noticed. Supplies of suspected plant forwarded.

February, 1928. Two cows died suddenly and this plant suspected.

Ariah Park.—March, 1928. This outbreak was investigated by Mr. A. L. Rose, District Veterinary Officer, and Mr. Stock Inspector Whyte, of Wagga, and the following is taken from their reports. The sheep in question were a lot of 1,100 mixed sheep in good condition. They were placed in a fallow paddock almost bare of feed where they remained for four days, it being the owner's intention to crutch them before putting them into another paddock where there was plenty of young green feed. Grasshoppers then visited the place

and ate out this second fallow leaving *E. Drummondii* and little else. The sheep were placed in the second paddock on the afternoon of 13th March when they moved down to a depression where the plants were most plentiful. The area of this paddock, it may be noted, was only 150 acres. The owner arrived the following day to take his sheep away to be crutched, and instead of finding them spread over the paddock, he found them grouped together in the hollow. Many were dead and many others were down and unable to rise. This was twenty-three hours after the sheep had been put in, and it was evident that a number had been dead for some hours. Owing to the large number of sheep sick the owner was unable to move them, and it was not until two or three days later that the remaining sheep were moved. Even then 100 were too sick to travel and were left in the paddock. The total losses were about 200, and practically all of these died early. The sheep that did not die early, even though very sick, recovered. Driving the sheep had the effect of bringing on symptoms in apparently healthy sheep, but after a little rest they recovered and travelled normally with the others.

The symptoms described were "staggering gait, affected sheep get down and are unable to rise; they have shivering fits and froth at the mouth, while the head is usually extended or bent stiffly back. No diarrhœa."

On post-mortem examination some congestion of the fourth stomach was noted. That the sheep had in fact eaten a large amount of the plant was shown by the identification of the rumen contents by the botanist.

This instance presents a feature not generally associated with this type of case, namely, that though the majority of the deaths occurred during the first twenty-four hours after the sheep had access to the plant in quantity, in a number symptoms persisted even for days, and in some cases in sheep which appeared to be healthy symptoms became evident on driving.

Various Districts.—A number of reports of losses in sheep which have been yarded for some time, or of detrucked sheep, allowed free access to the plant, have been received. The outstanding feature in those cases, where we have information, is that the sheep involved have been hungry. Sheep commonly graze in paddocks where the plant is plentiful without apparent ill effects unless other feed is scarce.

Tests at the Veterinary Research Station.

Owing to what we regarded as an unsatisfactory position with regard to this plant, arrangements were made (*a*) to collect information from the various Inspectors of Stock as to their experience of the plant, and (*b*) to have supplies forwarded for feeding tests. The identification of plants was undertaken by the Director, Botanic Gardens.

The general experience of Inspectors was that, though ordinarily this plant might cause no harm although it occurred in the pasture, yet, if hungry sheep had sudden access to it, the result might be the rapid death of a number

of the animals. Our suspicion that the plant was indeed a toxic one was therefore strengthened, and in view of Stanley's work it became more imperative than ever that it should be investigated more closely. In January last, therefore, supplies from two separate districts were tested.

It was found that though sheep would voluntarily eat a little of the gathered plant, especially if it were chopped up and mixed with a little chaff, they could not be induced to eat it really readily and in what we deemed adequate quantities for satisfactory determination. For example, two sheep were penned, and during six days consumed between them a total of 22½ lb. of the plant without showing ill effects. Recourse was then had to a method which we have used largely in our plant tests. A quantity (1 to 2 lb.) of the plant was passed through a mincing machine and macerated in water overnight. Next morning the mass was expressed and the fluid (2 to 5 pints) administered to a sheep as a drench.

By this means one particular supply of the plant was found to be highly toxic. This was secured in the Brewarrina district by Mr. Stock Inspector Quinn. Sheep drenched with such a "watery extract" from as little as 1 lb. of the air-dried plant were found to become severely ill within a few hours of administration of the drench, and to show symptoms suggestive of prussic acid poisoning. Death occurred in from two and a half to twenty hours of drenching, and post-mortem examination showed comparatively slight lesions, such as one usually finds in cases of prussic acid poisoning. A pronounced odour of prussic acid was detectable whilst examining the alimentary canal contents.

To confirm our suspicions, specimens of the plants used and of stomach contents of sheep that died following administration of these "extracts" was submitted to Mr. H. Finnemore of the Pharmacy Department of Sydney University, who had them examined by Mr. C. B. Cox (C.S.I.R. Research Officer), when it was found that they all gave positive reactions for prussic (hydrocyanic) acid.

Whilst these tests were being undertaken the mortality at Ariah Park was reported, and supplies of the weed were obtained from that district. A test showed that this plant was likewise toxic, though death in this case was not so rapid.

Other supplies have been tested in a similar manner, however, and have been found to be devoid of toxic effects.

That the toxic effects seen by us are due to the presence of hydrocyanic acid we have no doubt, for Mr. Finnemore informs us that quantitative determinations of the dried plant from Brewarrina have shown that it contains 0·085 per cent. hydrocyanic acid or 385 mgs. per pound weight of dried plant. Tests of supplies found to be non-toxic by us have given a negative reaction for hydrocyanic acid when tested chemically.

Conclusions.

1. There is strong evidence that under certain circumstances sheep may die from the effects of *Euphorbia Drummondii.*

2. The history in these cases shows that such is seen especially in starving or, at least, hungry sheep which suddenly have access to large quantities of the plant.

3. Though under such circumstances some of the losses may be due to hoven, there is evidence that the losses at other times are not due to such.

4. *Euphorbia Drummondii* may at times give off hydrocyanic acid in such quantities that even as little as 2 or 3 lb. of the plant may contain a lethal dose.

5. There is every reason to believe that sheep may, under natural circumstances, be poisoned by hydrocyanic acid from the plant. The history, etc., of cases strongly support this view, though up to the present we have not been able to secure material from a recently dead sheep for the requisite chemical examination.

6. *Euphorbia Drummondii* does not always give off hydrocyanic acid, and the conditions which determine the production of the cyanogenetic glucoside in this plant are not yet known.

7. *Euphorbia Drummondii* must be added to the list of dangerous cyanogenetic plants and trees which includes blue couch (*Cynodon incompletus*), bird's-foot trefoil (*Lotus australis*), rosewood (*Heterodendron oleafolium*) and (probably) variegated thistle (*Silybum mariana*).

Further work to determine the causes of variation in cyanogenesis is now being undertaken. For assistance in some of the experiments the writer is indebted to Mr. Grahame Edgar, B.V.Sc., McGarvie Smith Research Scholar.

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Embargo on Australian Eucalypts Entering Brazil.

Advice has been received from the Consul-in-Chief of Brazil, in Sydney, to the effect that the seeds or cuttings of *Eucalypts* from Australia and New Zealand, among other places, have been prohibited, for the time being, from being imported into any of the States or Federal District of the Republic of Brazil.

Cyanides Used for Fumigation.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist.

IN considering the subject of the manufacture of cyanide compounds, it might be profitable to review briefly the very interesting evolution of an industry, which, though at first utilising crude rule of thumb methods, is now of considerable magnitude and importance, and affords very definite evidence of the advantages of the practical application of science to industry.

The industry originated from the purely accidental discovery of Prussian blue by a Berlin dyer, Dresbach, who in 1704 obtained this compound by the action of alum and ferrous sulphate on certain potash residues which had been used in the rectification of an oil—the suggestion being made that Prussian blue was formed by the action of iron on potassa which had been in contact with organic animal substances at a certain temperature. This knowledge was applied industrially, and Prussian blue was prepared by calcining meat or horns with potassium carbonate. The product formed was extracted with water, and the solution, called "blood-lye," was treated with alum and sulphate of iron, producing Prussian blue, though its chemical composition or mode of formation was not then known.

In 1823 it was first definitely proved by Gay Lussac that these were cyanogen compounds. The method of producing these compounds remained unchanged, but about 1837, the formation of efflorescences of potassium cyanide in blast furnaces was recorded and subsequently potassium cyanide was produced by the action of a current of air on a mixture of potassium carbonate and charcoal, heated to redness. The importance of the discovery attracted the attention of manufacturers, who applied in a practical way the discoveries of investigators, whose efforts were directed to obtain synthetic production, and to discontinue the use of nitrogenous organic matter. Numerous patents were taken out for new and improved methods of manufacture.

As the result of the success of a process devised by MacArthur and Forest about 1890–91, in the extraction of gold by means of potassium cyanide, a great impetus was given to the cyanide industry, and the consumption of potassium cyanide increased to such an extent that manufacturers were unable to fill their orders—the mines at Johannesburg requiring about 200 tons per month. Manufacturers in England and in Germany then sought means of supplying the demands under the most economical conditions, with results that have been of the greatest importance in the progress of the industry.

Various Methods of Commercial Manufacture.

In the oldest methods, potassium ferrocyanide was prepared by heating together organic matter in the form of leather, wool waste, hartshorn, rags, horn, tendons, &c., and potassium carbonate; iron was supplied from the

bottoms of the iron cylinders in which the process was carried out, or was added separately. From this compound alkaline cyanides were produced. At first the ferrocyanide was heated alone, and subsequently heating was done with the addition of potassium carbonate, which produced potassium cyanide, potassium cyanate, and iron and iron oxide. The next steps in improving the manufacture were (1) the addition of charcoal which prevented the formation of cyanate, and (2) the substitution of sodium carbonate for the whole or a part of the potassium carbonate, thus cheapening the cost of production and improving the quality of the cyanide.

Subsequently the newer or synthetic methods were adopted. The first synthetic process by which cyanide was produced in large quantities was that of Siepermann and Beilby (1891), in which potassium cyanide, carbon monoxide and hydrogen were produced from the interaction of potassium carbonate, charcoal and ammonia. A little later Frank and Caro (1895) took out a patent which covered the use of carbides of alkaline earths, or a mixture of carbides prepared in the usual way by heating the oxide of the alkaline earth with charcoal. The carbide was roughly ground, heated in a tubular retort, to red heat, and moist air either wholly or partly free from oxygen admitted. Preference was given to barium carbide. After the reaction was complete, the product was treated with water, which dissolved the barium cyanide produced. The solution was filtered, and, by the addition of an alkaline carbonate, the barium cyanide was converted into alkaline cyanide. The resulting barium carbonate was filtered off and the solution, on concentration, gave alkaline cyanide. The results obtained were not entirely satisfactory, and after further investigational work, which indicated (1) that by using barium carbide, barium cyanide or cyanamide could be produced, and (2) that both products gave sodium cyanide on fusion with sodium carbonate, a new patent was applied for and granted in 1899. This method was largely used, but the whole process was modified as a result of the discovery that when calcium carbide is used instead of barium carbide, no cyanide, but only cyanamide is obtained. The mixture of calcium cyanamide and charcoal can be converted into cyanide by fusion with alkaline carbonates and chlorides, and it is by methods based upon these reactions that alkaline cyanides are now produced. The crude mixture of calcium cyanamide and carbon is now known as nitrolim, and is used as a fertiliser.

The importance of this industry is indicated by the fact that France produces about 150,000 tons cyanamide per annum, Germany 120,000, and America 200,000 tons, of which one American company, at Niagara, produces 60,000 tons—this plant is capable of producing 80,000 tons.

Fumigation of Trees with Cyanide.

Alkaline cyanides are chiefly used in connection with the extraction of gold from tailings and ores, but since 1888–90 they have been used for the production of hydrocyanic acid which is very effective in killing scale and insect pests on fruit and other trees.

The method of destroying the scale pests on fruit trees with hydrocyanic acid, as first practised, consisted of covering the trees with a canvas tent, and liberating hydrocyanic acid gas produced from the interaction of an alkaline cyanide and sulphuric acid, the reaction taking place in an earthenware vessel or pot placed inside the tent. The quantities of cyanide and acid and the time required for the destruction of the scale, were determined by experiment, and tables indicating the quantities to be used for effective treatment were drawn up. This method became known as the pot method of fumigation, and it remained in general use for many years, but in 1916 liquid hydrocyanic acid was used in experimental tests in California, and on an extensive and commercial basis in 1917, for the fumigation of citrus trees. The hydrocyanic acid gas liberated from the interaction of an alkaline cyanide and sulphuric acid was compressed to a liquid, and used in fumigation as such, claims being made of greater efficiency by this method.

At a later date, calcium cyanide in dust form was tried, and the results obtained have in the main been highly satisfactory. At a still later date (1925) a pure calcium cyanide was successfully prepared on a commercial scale in California from liquid hydrocyanic acid. These later developments in connection with fumigation will be dealt with in a subsequent article.

The Quality of Alkaline Cyanides.

The alkaline cyanide procurable at first was potassium cyanide of about 98 per cent. purity, but subsequently, owing to the adoption of other methods of manufacture, as indicated, sodium was used to partly or wholly replace potassium, and the product available was actually a mixture of sodium and potassium cyanide or sodium cyanide only. The cyanogen content was expressed in terms of potassium cyanide, and the product was still loosely termed and referred to as " potassium cyanide."

In the compound sodium cyanide, twenty-three parts of sodium are combined with twenty-six parts cyanogen, forming forty-nine parts of sodium cyanide, or in other words, sodium cyanide contains 53·06 per cent. cyanogen. In potassium cyanide, thirty-nine parts of potassium are combined with twenty-six parts of cyanogen, forming sixty-five parts of potassium cyanide, or in other words potassium cyanide contains 40 per cent. cyanogen, and a potassim cyanide of 98 per cent. purity would contain $40 \times \frac{98}{100} = 39{\cdot}2$ per cent. cyanogen.

Now 73·9 parts of sodium cyanide would contain $\frac{49}{26} = 73{\cdot}9 \times \frac{26}{49} = 39{\cdot}2$ parts cyanogen, and a mixture of 73·9 parts of sodium cyanide and 26·1 parts of inert matter would contain as much cyanogen as 100 parts of potassium cyanide of 98 per cent. purity. Such a mixture would therefore be said to be equivalent to 98 per cent. potassium cyanide.

A pure sodium cyanide containing 53·06 per cent. cyanogen would be said to be equivalent to $53{\cdot}06 \times \frac{100}{40} = 132{\cdot}6$ per cent. pure potassium cyanide, or to $53{\cdot}06 \times \frac{100}{39{\cdot}2} = 135{\cdot}4$ per cent. 98 per cent. potassium cyanide.

Analyses of Alkaline Cyanides.

Samples of alkaline cyanides, as imported into this State in bulk, were recently obtained by purchase, and examined by the Chemist's Branch. The analytical results are given in the attached table.

CYANIDES Purchased on Local Market.

	No. 1.	No. 2.	No. 3
Potassium cyanide	10·52	11·58	12·60
Sodium cyanide	65·30	63·59	64·15
Sodium cyanate	4·20	3·20	2·42
Sodium chloride	11·24	14·20	15·16
Sodium carbonate	8·34	7·25	5·52
Undetermined	0·40	0·18	0·15
	100·00	100·00	100·00
Cyanogen expressed in terms of 98 per cent. potassium cyanide	99·1	97·9	99·7

As previously stated, these products are imported for use in gold extraction, but they are also available for use in fumigation. It is apparent that if a product were used containing 51 per cent. cyanogen = 96·1 per cent. sodium cyanide (or equivalent to 130 per cent. potassium cyanide of 98 per cent. purity), the impurities present would be only 4 per cent., and possible injury due to the presence of impurities would be considerably reduced.

Alkaline cyanides of this quality (130 per cent.) are manufactured, and as the cost per unit of cyanogen in these is the same as in the 98 per cent. quality, it is a matter of surprise that the higher grade quality has not been used for fumigation. The amount of 98 per cent. cyanide to be used, as given in existing tables, could easily be expressed in terms of the higher grade cyanide (130 per cent.).

EMPLOY BUSINESS METHODS IN FARMING.

THE majority of farmers now realise that in order to succeed they must not only be good producers but good business men as well. It is not enough to be able to produce commodities for sale, a knowledge also must be gained of methods of determining relative values of different producable products and suitable classes and types of animals; of avenues and methods of selling various classes of farm products, and of the markets upon which these products are to be sold.—R. W. BROWN, Manitoba Department of Agriculture and Immigration.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Potatoes—	
Brownell's	J. B. Howell, Glen Innes.
Carman	Johns Brothers, Strathalbyn, Myrtleville.
	M. Hoare, Myrtleville.
Early Manistee	J. J. Cusack, Stonequarry, Taralga.
Factor	R. E. Ball, Stonequarry, Taralga.
	E. McAlister, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
	N. C. Peters, Pinnacle Road, Orange.
Great Scott	J. B. Howell, Glen Innes.
Langworthy	N. C. Peters, Pinnacle Road, Orange.
Satisfaction	J. J. Maloney senior, Stonequarry, Taralga.
	M. Hoare, Myrtleville, Taralga.
	C. N. Hillen, Taralga.
Scott's Satisfaction	J. B. Howell, Glen Innes.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Sunnybrook Earliana ...	A. E. Johnson, Green Valley, via Liverpool.
Broom Millet	Manager, Experiment Farm, Coonamble.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Maize—	
Wellingrove	Manager, Experiment Farm, Glen Innes.
Grasses—	
Sudan Grass	Under-Secretary, Department of Agriculture.
	Manager, Experiment Farm Coonamble.
	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Trangie.
	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
White African	Under-Secretary, Department of Agriculture.
Saccaline	Manager, Experiment Farm, Lismore.
	D. P. Shearer and Sons, Glendon, Scott's Flat, Singleton.
Collier	Manager, Experiment Farm, Grafton.
Cowper (late Selection No. 61)	Manager, Experiment Farm, Grafton.
Grain Sorghums—	
Feterita	Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Orchard Notes.

OCTOBER.

C. G. SAVAGE AND H. BROADFOOT.

Codling Moth.

BEFORE these " notes " appear the first or calyx spray for codling moth should have been applied in earlier districts. In later districts the first application should be made during the current month. As this is recognised as one of the worst pests with which pear and apple growers have to contend, measures to control it should be vigorous, timely, widespread, and concerted, otherwise the pest will not be adequately controlled. The lazy, procrastinating, neglectful grower allows his orchard to become a loss to himself and a menace to the whole district.

Most growers are well aware of the measures to be taken. Before grub-emergence, a thorough inspection of bandages, used cases, and packing sheds should be made—merely a perfunctory inspection is useless. Sheltering grubs should be discovered and destroyed before emergence. This is also most important, because the new season's infestations are due to last season's carry-over grubs. Every orchardist knows the value of bandages. The bandages are sought and used by grubs in search of shelter. They are a common harbour—a quiet haven in which many sheltering grubs take refuge. Every fourteen days the bandages should be carefully inspected and any sheltering grubs should be destroyed. All other places in which the grubs may take shelter, loose bark for example, should be removed or given attention. The butt of the tree at ground level should be searched, because many grubs are frequently found sheltering there.

Of the spraying operations which should be carried out during the month, one of the most important is the first or calyx spray. Since all the blooms do not open simultaneously and all petals do not fall at the same time, it is very often advisable to give a double calyx spray. The first spraying should be applied with force enough to drive the poison into the calyx. Spraying that is not thorough is ineffective, and, therefore, the orchardist must display an infinite capacity for taking pains. The exact quantity of lead arsenate prescribed should be used, and the mixture should be well agitated before and during spraying.

The spraying season is no time for the man who eagerly consults his watch in anticipation of knocking-off time. The season during which the spray for codling moth can be effectively applied is short, many of the different varieties of apples and pear trees blooming simultaneously, and if, in addition, the orchards are considerable in area—and they sometimes are—it means that the situation must be faced resolutely, and no matter how the hours of labour are extended, the job, to be of value, must be completed.

expeditiously and thoroughly. Some growers who have achieved good results think they can safely relax their efforts. This is a great mistake. Precautionary measures are preferable to remedial measures, and where the codling moth is concerned it does not pay to "grow weary in well-doing."

Disbudding.

Grafted or budded stocks need careful attention, and the wise orchardist will periodically examine those put in during the previous summer. This periodical examination should be thorough, its object being to see that growths from the stock do not rob shoots from the graft or bud. Some shade for the stock, particularly when old trees have been budded or grafted, is desirable, and consequently all shoots from the stock should not be removed. Rather pinch back some of the weaker shoots so that they may shade the stock until the grafts or buds have developed sufficiently to form a head. Sometimes scions fail, and to meet such a contingency ample shoots from the stock should be left and budded later.

The Cultivator.

This useful implement should be kept going in order to destroy or to prevent weed growth and to conserve soil moisture. No observant grower fails to recognise the value of good cultivation. Two of its uses have been referred to. Besides these it conduces to vigorous tree development, it encourages a copious supply of blossom buds, and without it the grower cannot expect fruit of superior quality and satisfactory commercial size. The soil around the trees should be kept in good tilth. In many of the fruit-growing districts winter rains have thoroughly soaked both soil and subsoil. Cultivation will assist in conserving this moisture and in making the soil fit to receive and to hold showers yet to come.

Surface Drains.

Surface drains must be made to carry off excessive water, and they should be so distributed that they will do so with the least possible loss of soil or dissolved plant food. "Prevention is better than cure" is a trite saying, but very true in this instance.

Black Spot.

In localities in which apple and pear trees are susceptible to black spot, growers should seek to minimise, if not almost entirely prevent the trouble, by timely spraying. Lime-sulphur or Bordeaux mixture has proved so efficacious that spraying, if practised in time, will keep the fungus in check. It is well to state that apples and pears are very sensitive to Bordeaux mixture if it is applied at the calyx stage, consequently the application of that fungicide should be avoided unless it is absolutely necessary to use it.

Many growers of citrus fruits and of apples and pears are using benzine and similar cases for picking boxes. Whilst the cases are very suitable for such a purpose, it must be remembered that they are made of closely-fitted

boards and that fruit stacked in them is not sufficiently ventilated, even when spaces are left between the tiers of cases. Air circulation may, however, be secured by boring several large holes in the sides of the boxes. This will ensure ventilation in each box when the tiers are kept slightly apart. It may be pointed out that in many districts this season black spot developed extensively on apples in the stack. It is significant that this development was most serious in fruit that had been placed in benzine boxes and closely stacked in tiers, which arrangement prevented the free circulation of air.

Aphis.

A vigilant watch should be kept for the appearance of aphides upon Japanese plums, nectarines, peach and cherry trees, and if the pest is noticed the trees should be sprayed with tobacco wash or one of the commercial nicotine extracts. In applying the spray, use a high pressure and repeat the operation if necessary in two or three days.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.	Society and Secretary.		Date
Ardlethan	Oct.	3	Bribaree (Jesse Austin)	Oct.	10
Quandialla (V. Talbot)	,,	3	Griffith (W. Sellin)	,,	16, 17
Walbundrie (H. G. Collins)	,,	3	Deniliquin (P. Fagan)	,,	16, 17
Narrandera (J. D. Newth)	,,	9, 10	Cootamundra (R. D. Beaver)	,,	23, 24
Ariah Park (Mort Collings)	,,	10			

1929.

St. Ives (F. Clarke)	Feb.	8, 9	Gundagai (P. J. Sullivan)	Mar.	12, 13
Castle Hill (W. H. Taylor)	,,	15, 16	Kempsey (E. Mitchell)	,,	19, 20, 21
Blacktown (A. J. Greenaway)	,,	22, 23	Wallamba (E. A. Carey)	,,	21, 22
Tumut (H. Mount)	Mar.	5, 6	R.A.S., Sydney (G. C. Somerville)	,,	27 to Ap. 6
Cessnock (G. Badgery)	,,	6 to 9	Grafton (L. C. Lawson)	April	17 to 20
Campbelltown (W. N. Rudd)	,,	8, 9			

A Weedicide.

Replying to a correspondent who asked to be recommended a suitable mixture for killing weeds and grass, Mr. A. A. Ramsay, Chief Chemist, advised the use of a solution of 1 lb. sodium arsenite dissolved in 4 gallons of water. If desired, the sodium arsenite solution may be prepared by boiling together 1 lb. arsenious oxide (ordinary white arsenic) and ½ lb. caustic soda; or, alternatively, 1 lb. washing soda in 2 gallons of water, diluting to 5 gallons before using.

The mixture is highly poisonous, and its use cannot be considered free from attendant danger. In view of this it is a good idea to treat only a section of the area at a time, so that it can be securely fenced around with hurdles to keep children off it, thus reducing the danger to a minimum.

The above treatment will not successfully eradicate couch grass, although the top growth will be killed.

Poultry Notes.

OCTOBER.

E. HADLINGTON, Poultry Expert.

OCTOBER is a month in which much trouble occurs in the rearing of chickens. The main reason for this is that, as the weather begins to warm up, many poultry-farmers consider that very little artificial heat is necessary, and it is a common practice to cut off the heat supply when the chickens are about three or four weeks old. Then again, there are other poultry-farmers who do not worry about getting the temperature up in the brooders until, perhaps, late at night. The consequence is that the chickens pack together, and this results in trouble.

There is a disposition also to take the view that the later chicks cannot be reared as well as those hatched earlier in the season, and no serious thought is given as to the reason for this. If it were more generally realised that chickens hatched up to the end of September, given proper attention and conditions, can be reared almost as satisfactorily as the earlier ones, there would be some hope of effecting a vast improvement. Under present circumstances many poultry-farmers would be better off if thousands of chicks hatched at the end of the season were not brought out at all.

Another reason why so much trouble is met with in handling the last chickens of the season is that it frequently happens that insufficient chicks are hatched earlier, and an attempt is made to catch up at the end, resulting in a general overcrowding. This also occurs when small poultry-farmers indulge in the day-old chick trade. Orders are accepted early in the season, and no difficulty is anticipated in filling them; then something unforeseen happens in connection with the incubation, and the result is late chickens for home requirements, and an overtaxing of the equipment

Essentials in Rearing.

The observance of a few simple rules in handling chickens towards the end of the season would overcome a great deal of trouble. The first essential is that the chickens should not be crowded. Better to hatch less and rear them well than have large numbers of miserable undeveloped birds. Make it a rule that the brooder heater is kept going, so that if a cold change comes everything is in readiness to get up heat again. If the temperature is higher than necessary, allow plenty of ventilation in order to keep the brooders fresh. This is a most important point, because if the brooders or brooder houses are kept shut up closely when a high temperature is maintained, the air will become foul, and thus favour the development of germs and also have a debilitating effect upon the chickens. Therefore, the aim should be plenty of air consistent with retaining sufficient warmth for the chickens to go to if they so desire.

The chickens should not be rushed out of the brooders too soon. Remember that cold snaps occur frequently during spring, and many good chickens are ruined by a too hasty removal from the heat. It is better to run the

chicks in the brooder for six weeks (right up to the end of the season) than to take unnecessary risks. One appreciates the feeling of relief to have done with the brooding after a strenuous rearing season, but the urge to have done with the brooders must be resisted if the best results are to be achieved.

Chickens Affected with Weakness in Legs.

Quite a number of cases have come under notice this season where chickens about two weeks of age have gone weak in the legs. These chickens move about with an unsteady gait, and become ruffled and poor in condition. The mortality has been fairly high in a few cases, though some recover, and others remain in a chronic state of weakness and do not develop.

The trouble appears to be due to lack of pure air combined with an excessive temperature. These conditions have been found to be present in each case investigated, and when the conditions have been improved the trouble has disappeared.

In some instances the complaint has been experienced in hover brooders, while in others the box type of brooder has been in use. The main faults in the operation of the hover brooders were that bags were being draped over one side blocking the chickens from getting out, and the hovers were too low, being placed flat on the pipes, thus allowing insufficient air for the excessive temperature generated. In the case of the box type, the brooders were being shut up too closely and the temperature was kept much higher than is recommended.

The reason why so much trouble has been experienced in this direction is because of the abnormally warm winter. This has not been taken into account in the operation of the brooders and no allowance has been made for the mild weather as compared with the usually cold winters. A number of specimens were submitted to the Veterinary Research Station for pathological examination, but no infection of bacterial origin could be traced. Further experimental work, however, is being carried out in connection with the trouble.

Second Stage of Rearing.

On many farms no satisfactory accommodation is provided for the chickens after they leave the brooders, with the result that it is very often found that chickens which have gone through the brooders successfully receive a set-back in the next stage of rearing. A common practice is to place the chickens in large open-fronted houses, and often in semi-intensive sheds, in batches of 200 or 300. Some of the chickens go on the roosts and others crowd into the corners of the houses. This results in sweating, and even if no losses are sustained the birds suffer in health and their development is retarded. Even if most of them go up on the perches they still pack closely, and the more there are in the house the worse is the trouble, no matter how large the house. It is such conditions that are responsible for outbreaks of catarrh and roup when the sultry weather commences.

The only safe practice in housing chickens after they leave the brooders is to run them in small numbers, preferably from fifty to seventy-five in each house, and give them as much range as possible after they are about ten weeks old. The sooner they are taught to roost after leaving the brooders the better, and to this end it is a good plan to place a low platform of battens along one end of the house. This platform should be about 3 feet wide and extend across one end of the house, leaving no space for the chickens to get down underneath. The battens should be placed on two supporting pieces of timber, say, 4 inches x 2 inches, one on each side of the house, so that the platform will be about 5 inches high, and to prevent the chickens getting underneath a sloping board should be placed along the open end. The battens should be put close together for the first few nights, then separated by nearly half an inch, which space should be gradually increased by taking out a batten or two as the birds get older. But, until the chickens have learned to roost, the spaces should not be made so wide that they can get down between the battens. The main perches should be put in position a week or so after the chickens have been transferred from the brooders.

This matter was fully dealt with and illustrated in these notes last October, but as cases have been observed where chickens have suffered through faulty management in this stage a reminder is considered advisable.

Marketing Grillers.

The market for grillers this season appears to be somewhat weaker than during the past few years, which is no doubt due to the increased hatchings this year. Poultry-farmers would therefore be well advised not to send in small birds, especially after the end of this month. Well-grown cockerels, weighing 2½ lb. to 3 lb., should sell well for a while, but smaller stuff is better kept back.

As the season advances good prices can only be expected for really prime birds, and where there are facilities for keeping cockerels it is the best policy to hold them until they are a good size. Every year the market is glutted with thousands of small grillers and poussins, and they are sacrificed at a price which means loss to the producer. Much of this loss could be avoided by studying the market and sending in only the class of birds in demand.

Keep Early Cockerels.

Those who desire to retain cockerels for breeding purposes should not make the mistake of keeping only a few of the early ones to select from. Only those hatched up to early August are worth considering as potential breeders, and the mistake is often made of retaining only a few of these in excess of actual requirements. The result is that when many of those chosen do not turn out as satisfactory as anticipated there are not enough of sufficient merit left from which to make a final selection. For this reason at least twice the number actually required should be reserved.

In making the first choice of cockerels many beginners make the error of picking the very precocious birds, usually those showing large combs. These birds, which strut about and boss the rest at a very early stage, appear to be

active and vigorous specimens, but they are the class which mature quickly without attaining the necessary development, and never make the best breeders to maintain stamina. The right class of bird to retain is that which is somewhat slower in maturing, but grows a good frame before becoming set. This does not mean, of course, that the extremely sleepy, heavy type of cockerels should be kept. A little careful observation, and the marking by leg bands of some of the different classes, will soon indicate the right type to reserve.

Inferior and Mouldy Feed.

Poultry-farmers are advised to be on the look-out for foodstuffs containing moulds, &c., which are likely to cause serious trouble, especially amongst chickens. Cases have come under notice where losses have been sustained, and strong suspicion attaches to the feed used, which contained grains affected with mould and dry rot. Certainly the losses ceased when the grain was discontinued.

Moulds are known to be fatal to poultry, and any inferior grain should be looked upon with suspicion, though where such grain is finely ground it is difficult to detect their presence.

WHITE MAIZE COMPETITION, 1928-29.

THE Department of Agriculture has again decided to co-operate with local agricultural societies, the Royal Agricultural Society, and Messrs. Kellog (Australia) Proprietary Ltd., in the carrying out of maize competitions on the same lines as last year's contests.

Messrs. Kellogg (Aust.) Pty. Ltd., have again donated a substantial sum for prize money, amounting this year to £150, or £30 to be divided among the first second and third prize winners in each of the five districts into which the State has been divided. In last year's competition, only four districts were included, but this season the Northern Tableland (including Armidale, Glen Ines, Inverell, Uralla, and Tenterfield) will make a fifth district.

The judging will be undertaken by the Department's district agricultural instructors, and will be carried out at the same time and in conjunction with the field maize competitions now being conducted by the local agricultural societies in co-operation with the Royal Agricultural Society. The crops entered may be inspected twice by the judge, and points will be awarded for (*a*) germination and stand, (*b*) cultivation methods and weed control, (*c*) condition, appearance, evenness, &c., of the crop, (*d*) freedom from insect pests and disease, (*e*) purity and trueness to type, (*f*) estimated yield, and (*g*) suitability of maize for manufacturing purposes. Messrs. Kellogg (Aust.) Pty. Ltd., will allot the points under section (*g*).

Entries close with the local agricultural societies, and must be made within two months after time of sowing or germination of the crops. In he event of any local society not conducting a competition, individual mers will be permitted to submit an entry through their district society. ntry forms and detailed particulars can be obtained from the agricultural societies in the districts affected.

CONTENTS.

VOL. XXXIX. PART 11. NOVEMBER 1, 1928.

Agricultural Gazette of New South Wales.

The Sheep Blowfly.

CAUSE, EFFECT, PREVENTION, AND TREATMENT OF *Cutaneous myiasis.**

THE sheep and wool industry is perhaps the Commonwealth's greatest source of wealth, and the means by which a large number of its citizens make a comfortable livelihood. For many years past, however, the industry has suffered serious loss through the infestation of sheep by the larvae of the maggot fly (blowfly). That such loss was but little known in the early days of the wool industry is not to be looked upon as evidence that the flies were not present. Nor is Australia by any means the only country in which the fly is a serious source of trouble. Wherever the sheep industry has been fostered the fly question has been one of more or less importance, although it is possible that in no other country as yet has it become of greater importance than in Australia.

Before domestic livestock and rabbits were introduced the flies were simply scavengers, depositing their young or eggs in animal matter that happened to be rotting in the sun. Unfortunately, as not uncommonly happens with insects, the blowfly developed a new habit, and instead of merely " blowing " the dead wool of sheep which had died from any cause, took to " blowing " the damp or soiled wool on living sheep. At the same time the favourable breeding grounds for the flies in dead animal matter were enormously increased. During drought periods there became available large numbers of dead stock, to which at a later date there was added the animal refuse resulting from rabbit destruction. Carrion-eating birds, such as crows and hawks, were destroyed in large numbers, and consequently the dead animals which they would have consumed remained as breeding grounds. Coinciding with these changes came the change in the character of the fleece resulting from the effort to increase the amount of wool carried by the individual animal and to encourage wool to grow on all parts of the body. As a consequence, the blowfly pest has become a serious problem in Australia. Seized with this fact, the Department of Agriculture has devoted considerable attention to it, and a standing committee, representing the veterinary, entomological, chemical, and sheep and wool branches of the Department, is continuously in operation, supervising and carrying out experimental and research work in connection with the fly. Lately, the Council of Scientific and Industrial Research has come forward to assist in the work, and has appointed a veterinary surgeon and an entomologist to work exclusively on this problem. These officers work under the direction of the Director of Veterinary Research and the Entomologist respectively, the work being carried out in the lab-

* The matter in this article was compiled by the External Parasites of Sheep Committee.

oratories of the Entomological Branch, at Nyngan Experiment Farm, at Glenfield Veterinary Research Station, and at other selected farms and stations in the country.

Owing to the damage caused by the fly, administrative action was asked for by pastoralists, and *Cutaneous myiasis* (infestation with larvae of maggot flies) was declared to be a disease within the meaning of the Stock Diseases Act, 1923. Power already existed in the Act to order the destruction of carcases of infected stock. This power was taken under the Act in order that pressure might be brought to bear on owners who through their negligence in destroying carcases caused risk of loss to their neighbours.

This article deals with the conclusions so far come to by the departmental officers concerned regarding the whole question.

LIFE HISTORIES OF THE VARIOUS SPECIES.

The life history of the blowfly is so extraordinarily adapted to wide fluctuations in its climatic and nutritional environments that the flies and their larvae can stand the utmost of extremes with a reasonable chance of survival. In the last few years a number of observations have been made on the complete life cycle of most of the sheep blowflies, which reveal a large variability in the larval and pupal periods, both from the aspect of their duration and of their susceptibility to external conditions.

Metallic Blue Blowfly (Chrysomyia albiceps).—The eggs of *Chrysomyia albiceps* have been observed to hatch in sixteen to seventeen hours during summer, in eighteen to nineteen hours in autumn and in spring, and in about twenty-one hours in winter. The actual incubation period is thus directly proportional to the temperature, and doubtless much shorter when the eggs are deposited on sheep running in the sun in summer. After feeding for four or five days on carrion or for a slightly less period on living tissue, the larva commences the pre-pupal period, during which it endeavours to reach a suitable environment in which to pupate. Again, this period (the pre-pupal) varies with the temperature and humidity. It may be one and a half to three days in summer up to seven or ten days in winter. Consequently the total period in the larval (maggot) state varies from five and a half to eight days in summer to as much as fifteen days in winter. The pupal period is five to eight days in summer and early autumn and ten to twenty days in winter. The total period from the deposition of the egg to the emergence of the adult fly varies from a minimum of nine to twelve days in summer to thirteen to seventeen days in spring and autumn, while in winter a period of three to five weeks or more may be required. It is reasonable to conclude then, that when developing on living sheep the flies occupy a period of nine to fourteen days for their complete life cycle except during dry seasons.

Smaller Yellow Blowfly (Calliphora augur).—*Calliphora augur*, the species most prevalent in the spring and winter months, is capable of hatching in a period of a few minutes to six hours after deposition. The larvae,

after feeding for four to five days, undergo a pre-pupal period of four to eight days, followed by a pupal stage of ten to nineteen days, which gives a total of fifteen to twenty days for a complete life cycle. It has been observed, however, that meteorological conditions may influence these time limits in a most marked degree; in fact, wintry conditions give an extraordinarily prolonged cycle of two to three months.

Larger Yellow Blowfly (Calliphora stygia).—It is found that *Calliphora stygia* is by no means so susceptible to variation; a fortnight is sufficient for a complete summer life cycle, an increased period of twenty-seven to thirty-three days being taken in the late winter and spring months.

Smaller Green Blowfly (Microcalliphora varipes).—*Microcalliphora varipes* is similar to *Chrysomyia albiceps* in having a short developmental period of eight days, with a corresponding increase to two or three weeks under wintry conditions.

Green Lucilia Blowfly (Lucilia sericata).—More variation is found with *Lucilia sericata*, but for practical purposes a similar life cycle to that of *Chrysomyia albiceps* occurs.

Habits of Adult Flies.

A single female blowfly may deposit up to 300 eggs.

The seriousness of carcase infestation has been most clearly confirmed by recent experiments by the Entomological Branch on the range of flight of the sheep blowfly. The results of these investigations show the direct advantage of carcase destruction and the far-reaching danger of neglect in this respect.

Messrs. Gurney and Woodhill demonstrated that the sheep blowfly *Chrysomyia albiceps* could fly at least 10 miles within twelve days; a carcase is therefore capable of infesting a tract of country 20 miles in diameter or 314 square miles in area. Since *Chrysomyia albiceps* has an adult life of at least twenty-eight days, it is very probable that the actual range is much greater.

From data so far to hand it appears that the adult flies live for periods varying between eight days and one month, but there are indications that under some conditions they may live much longer.

Incidence of the Blowfly.

As a result of the work on the incidence of the sheep blowfly in New South Wales new features of importance have arisen. It is proved, almost conclusively, that the percentage and numerical incidence of the flies is directly dependent on the climate and nature of the country. Differences in altitude and in latitude and longitude produce quite appreciable changes. Inland areas, for instance, may experience an almost total absence of blowflies during winter, while near the coastal areas blowflies are always present in appreciable numbers owing to the more equable conditions. Again, a high altitude tends to give two isolated periods in the year during which a

high numerical incidence is observed, while stations on the inland areas of low altitude experience one high numerical preponderance of the fly which is extended over several consecutive months. The preponderance in numbers over other blowfly species of the blue-green blowfly, *Chrysomyia albiceps* in summer (November to March), with its decline in winter (giving place to *Calliphora augur* or *Calliphora stygia*), has been recognised for several years, and this is confirmed, without exception, by recent experiments.

Individually the species are influenced, in a varied degree, by climatic and other factors. *Calliphora augur* is perhaps more susceptible to change in temperature, humidity, and rainfall than any of the other five species. Rain combined with temperature changes has an immediate effect on the numerical incidence of *Chrysomyia albiceps*, though excessive variation in these factors does not entirely inhibit the appearance of this species. A high rainfall in the summer season is an immediate precursor to the rapid rise in the percentage of *Chrysomyia albiceps* present, whilst a reduced rainfall occasions a corresponding decrease.

Calliphora stygia is apparently almost immune to climatic changes, and shows a non-fluctuating predominance in winter with a consequent decline to almost zero during summer. In the western districts it has been found to occur only in small percentages at its maximum period, as compared with its appearance in other parts of the State.

Both *Lucilia sericata* and *Microcalliphora varipes* are more predominant in the spring months than at any other period of the year.

Interesting comparisons between the severity of the "strike" and the numerical and percentage incidence of the flies at the time of the striking have been made. It is confirmed that a high numerical prevalence of the blowfly does not necessarily indicate a high percentage of "strike" in the sheep; in fact, a scanty numerical incidence of the fly frequently accompanies a very severe period of attack.

Examinations of crutchings from struck sheep indicate that *Lucilia sericata* is the most serious of the flies.

The Effects of the Fly on Sheep.

Fly-strike amongst sheep may, of course, occur in connection with any wound on the sheep, such as a shear cut, marking wound, crow "pick," &c., but, apart from these purely secondary attacks of a wound by flies, there are those thousands of cases in which sheep become struck without this preliminary wounding, and it is chiefly with this type of maggot infestation that this article deals.

Situation of Fly-struck Areas.

Fly-strike amongst sheep occurs chiefly in the ewes, though it is by no means confined to them. The region affected in the ewe is usually that referred to as the "crutch," that is, those parts near the tail which become urine and dung-stained. In point of fact, fly-strikes may occur anywhere

in that vicinity, but chiefly either below the genital opening or a little to one side or the other. Strikes above the level of the tail are not uncommon, and from any of these situations there is often a tendency for the affected area to extend up over the rump. Thus a bad case may show a struck area involving a large portion of the surface of the buttock and back. Weak ewes are also often struck in the depression below the eyes.

Wethers are often struck about the pizzle, and rams about the base of the horns. Sheep of either class or sex may, however, be struck in any part of the body, though where any considerable number are struck in one particular place this is often due to some predisposing cause acting on the flock as a whole. Thus, in sheep in long grass it has happened at times that large numbers have been struck about the withers, that part becoming wet and soggy from the long wet grass. Rams may be struck on sores on the head caused by fighting, or even in the absence of such an obvious attraction. The maggots in these cases find their way to the junction of the horn with the skin. Here the skin and horn are soft, and there is usually a quantity of yolky matter. They form a crevice under the edge of the horn, and this part becomes a favourite haven. Further, it is well protected by the surrounding wool. The maggots burrow into the skin and soft structures underrunning the wool as the discharge seeps along, and in addition may gain the interior of the horns.

Lambs are sometimes struck on the top of the head as a consequence of getting that part soiled by excreta whilst approaching the udder from between the hind legs instead of from the flank. Fly strikes of the scrotum or tail of newly-marked lambs are by no means uncommon nor unimportant, and much of what is said of fly attack generally applies to this class of animal. Further the infestation is to be guarded against or treated by much the same measures, with the application in addition of special dressings at marking time to endeavour to ward off infestation. Strikes of other wounds, such as shear cuts or crow "picks," are essentially similar; the latter are usually dangerous woundings on account of their location in the eye, and are commonly fatal as a result of bacterial infection.

Causes Predisposition to Fly Attack.

All types of sheep are subject to fly attack, but the general conformation undoubtedly has a big bearing on the susceptibility of the flock as a whole, though some sheep seem specially attractive to fly and they are struck repeatedly, apparently without any particular reason. Merino sheep are close-woolled, and are narrow behind, some more so than others, and that is why this breed, and particularly the latter type, are so often wet and urine- and dung-stained when sheep of other breeds or wider in the breech are dry or only slightly soiled. Speaking generally, it is the "wrinkled" type which is most susceptible. Sheep with wrinkles in the region of the crutch are more liable to retain the natural secretions of the skin of that part than is the case with plain-bodied sheep. Again, sheep with a considerable

amount of wool round the breech, and particularly if the wool-covering area is increased by a wrinkled skin, are more liable to become soiled in those parts, and the soiled wool is more likely to remain damp.

The soiling of the part is often contributed to by special factors, such as discharge following lambing or soft excrement from luscious green fodder—to say nothing of the pronounced soiling by actual diarrhœa. Ewes that have had difficulty in lambing, especially if they are cast and unable to rise, may have a large damp area in the region of the breech. Again, weaners often seem prone to soiling when the older sheep remain clean. Thus the retained yolk, skin detritus, excrement or discharges, particularly if damp or wetted by rain, and more especially if the part is soiled by urine, as it usually is, are liable to decomposition changes. One then finds that from this part there exhales a peculiar odour, distinctly ammoniacal if there is much urine soiling. The development of this is assisted by warm weather, particularly by humid weather, as then the part does not get a chance to dry. If the amount of wool is great the surface may dry, but next the skin there is a moist smelly layer of marked attractiveness to flies.

One may sum up by saying that the factors predisposing to attack are :—

(*a*) Conformation which allows a staining of the crutch and the retention of the skin secretions of the part.

(*b*) Soiling of the part by urine and dung.

(*c*) Presence of such length of wool that the part (at least that next the skin) does not become dry.

(*d*) Any special factors such as scouring, lambing, &c., which favour contamination of the crutch.

Detection of Struck Sheep.

A struck sheep is usually detected by the following symptoms: The animal appears to be irritable and uneasy, and when feeding is frequently seen to stamp one hind leg. Often an animal is noticed with its head down close to the ground, but making no attempt to feed, and frequently moving a few paces to stop and move on again amongst apparently contented sheep Occasionally the animal may be seen to turn around and bite its crutch—when that region is struck, as is usually the case. This act of biting the crutch is seen especially in lambs. In other cases the animal separates from the flock and seeks the shade of a tree or stump, where it stamps its feet, wags its tail and turns quickly from time to time, or bites at the struck part as if to dislodge its irritant.

The above symptoms are best noted before the sheep are disturbed and whilst they are grazing quietly. When they have been mustered they are not so well shown, and then one depends largely upon the appearance of the wool around the crutch in detecting struck sheep. Of course, if the sheep are left undisturbed for a while the symptoms due to irritation soon reappear, the twitching of the tail and stamping of the hind foot particularly attracting attention.

The foregoing applies particularly to a case where the maggots are plentiful and are firmly established. Where only a small patch is affected and there are only a few maggots there is more difficulty in detection, but on close observation one usually sees some signs of irritation.

On making a closer examination one notices the wool over the affected part to be of a dirty greyish-black colour and ragged in appearance from the effects of biting. If the sheep is now caught it will be found that there is an unusual blackish exudate, which has a peculiarly offensive odour, coming away from the wool round the area and usually running down along the skin for a short distance. This exudate also discolours the wool, which may be matted together.

The maggots are found at the base of the wool, usually making wounds in the skin and thus causing the irritation exhibited by the sheep. (On rare occasions the maggots may be found in the folds of the skin devoid of wool close to the anus or vulva even though the wool is not struck). If left untreated the maggots spread and the smell from the exudate attracts more flies, which strike the sheep anew, and the wool comes away, leaving a raw bare patch. Sometimes the smaller maggots continue to burrow into the raw area, but more commonly they travel to fresh wool to avoid exposure and so the area is increased. One often has to track the maggots 3 to 4 inches, round the side of the leg or up the back, from the position in which they first started.

Untreated sheep sometimes recover—that is, where the struck area is not too large the maggots may attain their full size and leave their host. In other cases the maggots continue to spread and increase in numbers, the wool usually coming away from the skin as they work along until patches six to seven inches across are quite denuded. If still untreated the maggots continue to spread, the sheep leaves the rest of the flock and is found in a secluded place in a very dejected and dull condition. The sheep then has little or no desire to move and is easily caught when approached. It commonly gets its eyes picked out by crows. The skin about the affected area becomes black and gangrenous and the wool comes away. It may then linger on for a day or two in a state of semi-coma, but death generally supervenes. In cases which have been severely affected, but in which the animal, either through treatment or otherwise, has become freed of the maggots, there is a tendency for the wool to "break" and to slough off over part or even the whole of the body.

Sometimes in bad cases the maggots enter the vulva or the rectum and set up areas of inflammation therein.

The lesions caused by the various types of maggots vary in severity. The hairy maggots from the green blowfly appear to be the worst in this respect spreading more quickly and causing more extensive wounds than the other species.

METHODS OF CONTROL.

The means by which the sheep blowfly may be controlled will be discussed under two main headings, namely—(1) Prevention of Infestation, (2) Treatment.

I. The Prevention of Infestation.

The methods by which infestation may be prevented are also of two kinds :—

1. Methods which aim at destroying the fly or preventing it from breeding, thereby reducing the incidence of flies to a minimum.
2. Methods which aim at rendering the sheep insusceptible to fly attack or which are calculated to prevent the maggots from developing on the sheep.

MEASURES TO PREVENT BREEDING.

Four lines of activity may be considered under the first of the abovementioned divisions, namely :—

(*a*) Destruction of carcases.

(*b*) Poisoning.

(*c*) Trapping.

(*d*) Biologic control by means of prasites and predators.

Destruction of Carcases.

While the burning where possible of all carcases and offal is strongly advocated, such difficulties as shortage of wood and labour and the danger of fire are fully appreciated. Where burning is possible the most effective methods are to pile up a good fire and place the carcases on top, or to dig a shallow trench, sloping both ends, place the fire in the trench and then to lay the carcases across the top, if possible supported by bars or by stout pieces of wood. In both these methods the whole carcases will be burnt, whereas if the fire is only heaped on to the carcase there is always a considerable chance that while the top may be scorched, or burned, the lower part of the carcase remains comparatively undamaged, and consequently is available as a developing ground for maggots. It may be that there are already large numbers of well-developed maggots underneath the carcase: —in such case the soil in which these are found should be shovelled up and thrown on the fire.

Where a carcase cannot be burned it should be skinned, laid open, the viscera hauled out, and the whole thing cut up as much as possible so as to expose it to the sun and to carrion-eating birds, animals, and insects such as ants. In this way it will not be such a favourable ground for maggots to develop on and many will be destroyed.

The simple action of turning a carcase over and exposing the maggots to their natural enemies will often result in many of them being killed.

Carcases which are dealt with otherwise than by burning should, if at all possible, be cleared up when circumstances are favourable, as they may be the cause of spreading disease other than that due to flies amongst live-stock.

Poisoning.

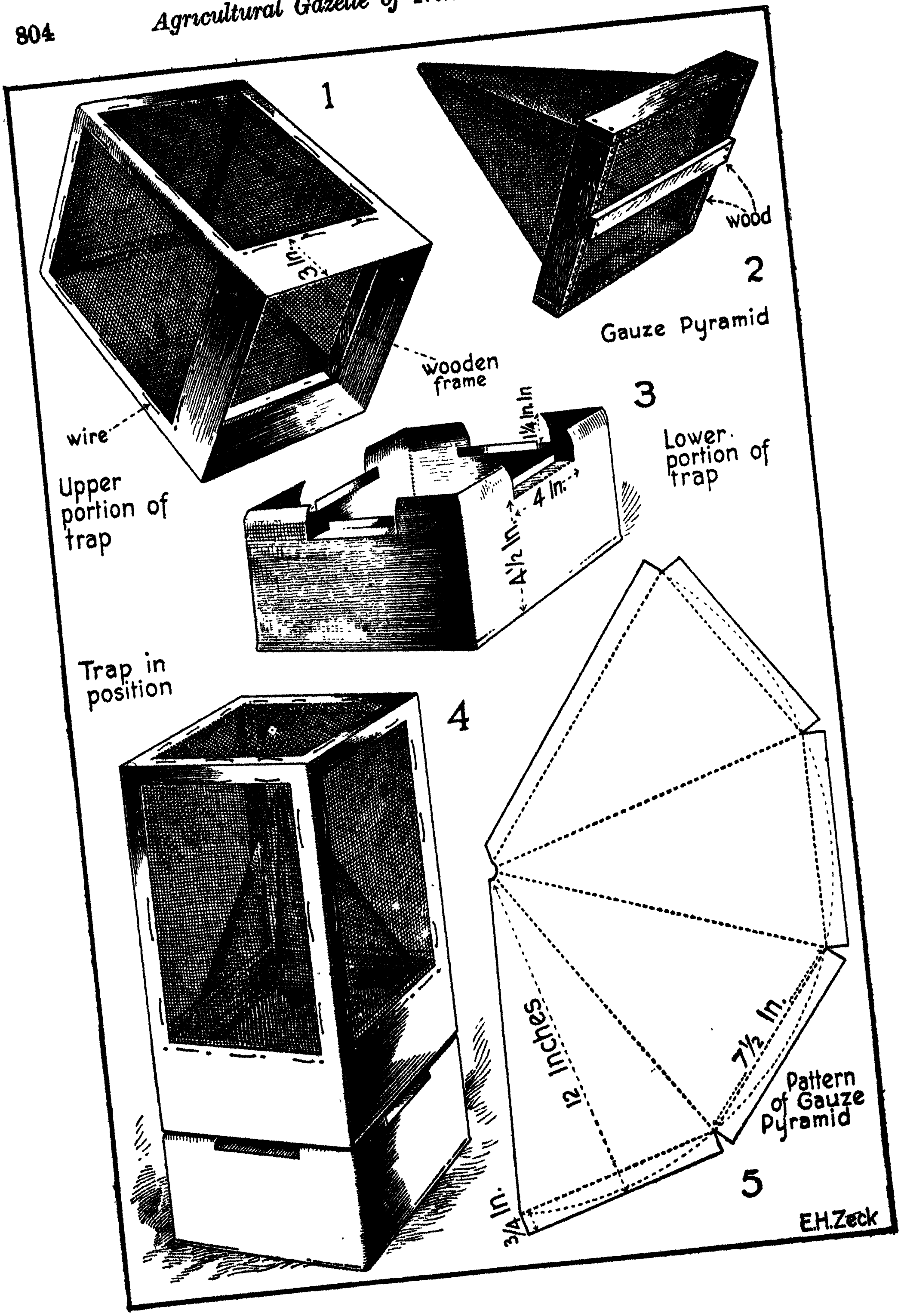
The systematic poisoning of blowflies and maggots by treating the carcases of dead animals with a poison in solution is an important factor in the extermination of the fly, and an excellent means of dealing with the carcases where burning is not possible. A dead animal on a warm summer's day has a magical attraction for all flies, and if it is saturated with an arsenic and water solution adult flies feeding on the liquid will be killed; similarly the arsenic will poison the maggots in the carcase.

Arsenite of soda at the rate of ½ lb. to a kerosene tin of water is recommended for this work in preference to white arsenic, owing to the ease with which the former can be dissolved. A quart of hot water (not quite brought up to boiling point) should be poured on the arsenite of soda in a bucket and well stirred until the arsenite is dissolved, and the rest of the water then added. It is best to slash or score the carcase with a knife, and even to open the body, so that the poisoned water may penetrate. When a carcase has been dealt with in this manner and has dried the remains tend to become hard and odourless from the action of the arsenic; no more flies will be attracted to it, nor will they deposit their eggs upon it, and as the maggots already there have been killed by the arsenic it will breed few flies.

The poisoning of flies can be extended by putting offal, or dead rabbits, or even a carcase in a trough containing arsenic water, and placing at any suitable point where the blowflies congregate, *e.g.*, the drafting yards near the woolshed. It is essential to cover such troughs containing arsenic-poisoned water with wire-netting in order to prevent dogs, stock, birds, &c., from being poisoned.

Trapping.

Amongst the measures which may be employed for reducing the prevalence of sheep blowflies trapping takes an important place. Large scale tests of the relative merits of the South African pattern trap, with the entrances on the side, and the older Australian trap with the entrance at the top, have shown the newer type to be much more effective. During these tests, however, an improvement on the South African trap was devised in Western Australia (see accompanying illustration). In principle, this trap is very similar to the South African one, but the design of the entrance has been modified so as to further limit the chance of the flies escaping. Another advantage is that the trap is more simply constructed, and can easily be made by the farmer. It consists of three parts—the fly chamber (see 1 in illustration), the pyramid (2), and the receptacle for the bait (3)—and is constructed as follows :—


1
3 In.
wooden frame
wire
Upper portion of trap
2
wood
Gauze Pyramid
3
1¼ In.
4 In.
4½ In.
Lower portion of trap
Trap in position
4
12 Inches
7½ In.
¾ In.
Pattern of Gauze Pyramid
5
E.H.Zeck

Completely remove the bottom of a petrol tin and hammer out the rough edges. Remove portion of the top, leaving a margin of 1 inch, and portion of each side, leaving a margin of 1 inch all round except at the bottom, where the margin should be 3 inches. Along these margins punch holes every 2 inches to enable the gauze to be attached. Cut a strip of fly-proof wire gauze 3 feet long and 11 inches wide, and fix around the inside of the tin, attaching it with staples or wire inserted through the holes made in the margins for the purpose. Cut another portion of gauze to fit the top, and sew or staple into position as before, Now nail into position, 3 inches from the bottom and around the inside of the tin (with 1 inch nails clinched on the inside), ⅜ by ½ inch wooden strips. These will act as a stop for the pyramid when the trap is assembled.

The gauze pyramid is tacked on the inside of a frame (see 2 in illustration) made of four pieces of wood 1¼ inch by ⅜ inch and constructed to fit the inside of the petrol tin. The frame is movable and is inserted into the tin until it comes in contact with the wooden stop previously fixed on the inside. The frame should fit sufficiently tightly to keep the pyramid in place, but not so tightly as to prevent its easy removal. Across the framework of the pyramid is nailed a strip of wood to act as a handle with which to withdraw the pyramid when removing the flies from the fly chamber.

The pyramid is most easily constructed by means of a paper pattern as illustrated in (5). It is formed by folding at the dotted lines radiating from the centre and sewing with wire through the overlap, and it is fastened on to the inside of the frame with tacks through the four flanges. The cut at the centre should be of such a size as to leave an orifice at the apex of the pyramid just about large enough to admit an ordinary lead-pencil.

For the third section of the trap (the bait receptacle) portion of a second petrol tin is needed. This tin is cut off 5¾ inches from the bottom, the balance being discarded. In the centre of each side make two cuts 4 inches apart and extending 1¼ inch downwards, bend the portion between these slits inwards to a horizontal position, and turn up the last ¼ inch. This provides an entrance platform for the flies, the upturned ¼ inch cutting off the light and preventing the flies from escaping. A 1-inch cut is then made in each corner of the tin and the sides splayed or bent in. This makes the top of the bait chamber smaller in girth than the fly chamber, and allows the one to be fitted over the other. The fly chamber should so fit on the bait receptacles as to leave not more than a ⅜-inch space over the slits for the entrance of the flies.

Upon completion the whole of the trap should be painted a dull colour or varnished to preserve the tin. The bait chamber is then baited and the trap set out. Any offal, but preferably liver, can be used as bait, which must be almost covered with water to ensure fermentation and to prevent flies breeding in it. The bait should be kept moist and attractive to the flies. A handful of tobacco dust can be thrown into the water to destroy any maggots which may develop in the bait.

The traps should be set actually on the ground, wherever the sheep congregate or where experience has shown that the flies abound. The trapped flies are killed with a paper flare, the pyramid being pulled out to permit of their removal.

With the aid of a dozen or so of these easily constructed traps the number of adult flies on a property can be lowered quite appreciably, and even if the effect is not marked it must be remembered that every fly caught is a potential breeder of hundreds of maggots.

Biologic Control.

The value and importance of possible "biologic control" of sheep blowfly by means of parasites or predators has led to investigations by the Entomological Branch of the Department. Following is an outline of the position and the work done :—

Seven hymenoptera internal parasites have already been recorded from Australia, namely :—

Mormoniella (*Nasonia*) *brevicornis*, Ashm.
Spalangia muscidarum, Rich.
Dirrhinus sarcophagae, Frogg.
Chalcis calliphorae, Frogg.
Australencyrtus giraulti, John. and Tiegs.
Stenosterys fulvoventralis, Dodd.
Pachycrepoideus dubius, Ashm.

Of these *Mormoniella* (*Nasonia*) *brevicornis* has been tested on a large scale by the distribution of millions of the living parasites developed in the Department's insectaries. These wasps have been established widely throughout the western districts, but so far they have exercised no appreciable control of the sheep blowfly.

Arrangements were therefore made by the Entomologist with the Imperial Bureau of Entomology, London, for a supply of an European blowfly parasite (*Alysia manducator*), and during 1926 living specimens were received from England and developed by the Entomological Branch. It was found that this parasite would develop in the smooth-bodied maggots of *Lucilia* and *Calliphora*, but, while they attempted to oviposit in the tougher skinned hairy maggots of *Chrysomyia albiceps*, they did not successfully parasitise them under laboratory conditions. Further introductions of *Alysia* were made early in 1928, and some of the parasites were liberated in the open at Gundy, near Scone, carcases of rats and rabbits and pieces of meat being placed in the vicinity in order that there might be plenty of maggots immediately available for the parasites and their progeny to develop on.

Both in the laboratory and in the field where the *Alysia* were liberated it was noticed that one of our Australian parasites, *Mormoniella* (*Nasonia brevicornis*, attempted to, and in the open did freely, parasitise the pupae of the blowflies. Also a second Chalcid species, *Chalcis calliphora*, appeared

freely on the maggot-infested carcases set out in the open for purposes of establishing the newly-released *Alysia manducator.* It was also recorded that the Histerid beetles *Saprinus laetus* and certain carrion-infesting Staphylinid and Dermestid beetles were numerous on the carcases set out, and that the Histerid beetles destroyed great numbers of the pupae of the blowflies, including, it is assumed, a considerable number of parasitised pupae, and thus doubtless destroyed some of the pupae bearing the parasite *Alysia manducator.* It is in spite of such natural enemies, however, that any introduced parasite will need to succeed if it is to successfully establish itself and increase and spread in Australia.

Arrangements have been made by the Entomologist for any other Hymenopterous, or other internal parasites, as well as for any possibly useful predatory insects, to be forwarded to him by the Imperial Bureau of Entomology should records indicate any which might conceivably be effective in Australia.

(*To be concluded*).

Spray Regularly for Downy Mildew.

ALTHOUGH growers pay regular attention to the spraying of their vines as a protection against downy mildew for a year or two after experiencing a severe set-back from the effects of the disease, they are apt to become lax if for a few seasons no further trouble is experienced. It is wise, however, to treat such spraying as a routine operation, and in wet seasons to continue spraying even after the crop has been vintaged.

The late summer rainfall was abnormal in most of the wine areas last season. At Liverpool, in the Cumberland district, for example, the rainfall for January was 228 points, and for February 748 points; at Penrith the rainfall in January was 269 points, and in February 847 points. Such heavy falls at this period of the year are very favourable to fungus development, and attacks by downy mildew before the wood of the vines is thoroughly matured or ripened must seriously affect the constitution of the vine. Late attacks of downy mildew last season have severely affected the maturing of the wood, and some vineyards have been very seriously hit. Not only has the season's pruning wood died right back to the base buds, but in some instances vines have died outright.—H. L. MANUEL, Viticultural Expert.

Summer School for Beekeepers at H.A. College.

ARRANGEMENTS have now been completed by the Department of Agriculture for the holding of the usual Summer School in Apiculture at Hawkesbury Agricultural College from 2nd to 18th January next, both dates inclusive. Prospectus and full particulars are available from the Under-Secretary.

The syllabus of instruction covers all branches of practical work in connection with beekeeping, and includes a series of lectures dealing fully with the various aspects of the industry.

The fee for the course is £3 10s. (including instruction, board and lodging), and applications will be received from persons of either sex over the age of 16 years.

Dingoes.

Their Destruction and Control.

K. S. McINTOSH, Veterinary Officer.

The origin of the Australian dingo is still a matter of discussion among naturalists. Most of our native animals are marsupials, but the dingo or warrigal is a true canine of the northern wolf type. Not only are we concerned with the ravages of the pure-bred animal, but also with the numerous crosses and mongrels which are so common in many parts of the country.

The following is a description of the true dingo or warrigal:—

The true dog, specialised into even type, having rather long, coarse, tawny hair, with greyish underfur; top of head and dorsal region (back) generally darker; underparts lighter; tip of brush tail generally white; feet and chest may also be white, especially in Queensland animals; cheeks and outside of legs generally tawny. A white race, and black specimens with white points are sometimes met with.

Dingoes prefer hilly country where they can get cover. They appear to migrate to the coast in winter where possible and return in summer. They hide in the day time and hunt at night, their natural prey consisting of small animals, but with the advent of sheep they were provided with much easier victims, which they kill not only for food but for the pure sport of killing. Dingoes do not bark, but emit a dismal howl which is often an indication that their lair is near at hand. Whelping occurs in spring, and five to eight pups are born in a litter. As a rule dingoes choose a secluded spot to breed, *e.g.*, a hollow log or under a bush. The young stay with their mothers for some time, and are taught to hunt from early puppyhood. Dingoes readily cross with the domestic dog, and at present pure-bred dingoes are rare except in uninhabited country.

As a result of his much deserved persecution, the dingo has become extremely cunning, and is suspicious of man or anything that smells of man; thus, while the pure-bred unsophisticated animal is comparatively easily caught, it is the mongrel type, particularly those that have been nipped by a trap or made sick by a faulty bait, that are the most sagacious and difficult to bring to earth.

The destruction and control of dingoes is accomplished by the following methods:—Trapping, poisoning, shooting, fencing. Before proceeding to outline each of the above, it is desired to point out that co-operation of owners is absolutely essential if the pest is to be successfully combated.

Trapping.

If trapping is practised on an extensive scale it would pay some owners to employ a professional trapper under somewhat the same conditions as

those governing the employment of rabbit trappers, paying a bonus for scalps. A trapper can attend from 150 to 200 traps and may have to cover the total distance of 150 to 200 miles. The following information is supplied to meet the needs of those who do not consider their holdings large enough or badly enough infested to warrant the employment of such trappers.

The Traps.—Traps may be obtained from most ironmongery stores. They are of different sizes, the type generally used weighing 8 lb., with a space of 8 inches square between the open jaws. The jaws are provided with teeth which should not be too sharp, otherwise the dog may have his leg amputated or, perhaps, his foot nipped off and become, although lame, extremely troublesome by reason of his sharpened wits. A trap should not be too sensitive or it may be sprung by rabbits, etc. To test it, drop pieces of wood of different weights from a height of two feet on to the plate, the piece which just sets it off should weight 2 oz., and if this is not so the trap should be adjusted. Always overhaul traps after they have been sprung, in case they should be damaged or wrenched in some way.

Location of Traps.—This depends solely on the particular class of country. Behind logs and stones, on old dry watercourses, unused roads, tracks, etc., in the vicinity of waterholes, clear patches in scrub, are all good places. It should be borne in mind that although the dingo may seek his quarry by very crooked and roundabout tracks, he returns to his lair by the shortest route. Other traps may be set off the track near bushes, shrubs, etc.

Setting the Trap.—There is some diversity of opinion as to whether the dingo will approach a spot if he suspects that man has recently been there. This is probably only correct with the veterans who have learnt all that man can teach them about traps. The younger ones and less cunning members of the species are known to follow men at some distance along a path.

The spot being selected, first dig a hole approximately the same size as the trap and sufficiently deep to have the plate about ¼ inch below the surface of the ground. Open the trap and place it in the hole, cover the jaws and plate with a piece of brown paper about 14 inches square. Do not use white paper, for should some of the soil blow away and the paper become exposed, dogs will become suspicious and avoid the spot. Now pack the earth firmly around the jaws and spring, and cover the whole with earth. Make the place appear as natural as possible by fanning the surface of the soil with a hat, also by avoiding leaving pieces of paper, etc., lying about. The proximity of the trap may be marked by a dead bush or some similar natural object.

Never fasten a trap to the ground, as the dog may be able to tear himself free. It is better to rely on tracking him. Some trappers prefer to place poison on the trap as the dog often bites it in his endeavours to free himself. This, however, is a matter of personal opinion, both methods being worth a trial.

Decoys.

Several decoys have proved successful. Dragging the punctured carcase of a sheep over the ground by tying it to the axle of a cart and eventually leaving the carcase on the road in the line of traps is a good method.

Remember that most dogs would rather attack live sheep than dead ones, so that the paddock should be emptied before setting the traps, not only for the reason stated above, but also on account of the risk of sheep being caught by the very means which aim at their protection.

Oil of rhodium and oil of aniseed are frequently used, being placed on the boots of the trappers.

A live slut in heat led along the line of traps is an excellent method.

The dung of domestic dogs is perhaps one of the best decoys. Use about a dozen pellets and place the traps about 18 inches to 2 feet away, so that when the dingo approaches the decoy he will place his foot on the correct spot.

Dogs' urine is sometimes used, but is not always easy to obtain and has to be renewed frequently owing to evaporation.

An excellent idea is to place the traps along the outside of a dog-proof fence; this will catch dogs that run along the fence seeking a place of ingress. If dogs have discovered a hole in the fence, set a trap in the hole before repairing.

Traps should be inspected once or twice a week. In setting beside water-holes or under water where the track crosses a creek, it is desirable to approach the spot selected from the opposite side, wading through the water and thus leaving no tracks. In this case be sure that the trap is well greased before setting.

Poisoning.

Poisoning is best carried out in the cooler months of the year.

Butter, fat, fish, liver, kidney, pork, meat, and suet are all excellent baits. The first two are rolled into balls, the remainder cut into one-inch cubes. Strychnine is probably the best poison to use, and three grains (as much as would fit on a threepenny piece) is sufficient. This is inserted into the middle of the ball or cube through a small knife slit. If practicable, do not touch the bait with the naked hands. If this is done, scorch it over a flame to eliminate any human odour.

One American bulletin, in reference to coyotes, states that a carcase should not be poisoned, but that coyotes should be allowed to eat some of it and the poison baits should be placed all round it, 21 to 30 feet away. The same bulletin suggests the placing of strychnine in small gelatine capsules in the bait to prevent as far as possible its nauseating taste. In Western Australia the following plan was adopted. Sheep were placed at night in a small dog-proof yard in the middle of the paddock. From this yard radiating trails were made by dragging a carcase or a fish, and round the fence of the yard poison baits and traps were set.

The same general principles as mentioned in trapping should be carried out regarding the placing of baits, trails, and decoys. Carcases of dead lambs may be poisoned by inserting 3 grains of strychnine into a muscular

portion through a knife slit. When baits are placed on the ground always have them as fresh as possible and covered with a few dried leaves or a piece of bark. Another method is to wrap the bait in a piece of newspaper. The dingo, being essentially an inquisitive animal, will unroll the paper and devour the bait. This trick may not work for long, the animals becoming very suspicious of the paper after a time.

Strychnine a Deadly Poison.

The following should always be borne in mind:—Strychnine is a powerful and deadly poison to man and animals and should always be regarded as such. Label all containers with a poison label and be careful to wash the hands thoroughly after using, and never allow it to be placed near any food. Domestic dogs should be chained up and neighbours notified of intention to lay poison. Notices should be erected on land and placed in local newspapers that poison baits will be laid.

Fencing.

Many specifications have been drawn up for the erection of dog-proof fences. Group fencing has been practised in some districts with considerable success and is to be recommended, providing that the holdings within the group are not too large. Barrier fences have been suggested if the pest becomes very prevalent, but at present would hardly be warranted in New South Wales, except on the borders.

The following are some specifications for dog-proof fences:—

1. A fence at least 5 feet in height, with netting 4 feet 8 inches high. The combination netting (larger mesh at the top than at the bottom) is recommended. A barbed wire should be put 4 inches below the ground level and one on top of the fence. A plain wire is required about 2 feet from the ground and another at the top of the netting.
2. Posts 8 feet 6 inches apart, netting 6 inches in ground and 3 feet out of ground; a barbed wire 5 inches above the netting, a plain wire 4 inches above the barbed, and a second barbed wire 5 inches over the plain wire or a total height of 4 feet 2 inches. Brace the fence with No. 16 wire, three braces in each panel, bracing wire being securely fastened to the top of the netting. Give a turn round the plain and the barbed wire, then secure to the barbed wire on top. This makes it very rigid, preventing the barbed wire from lifting from the netting to allow a dog to pass through.
3. Fence 5 feet high, 17 gauge netting, a barbed wire just on or over the surface of the ground. Wire netting must go below this barbed wire and be either laced to it or stapled with 6 to 9 inch staples at every 2 feet. Fence should lean outward from the perpendicular 6 to 9 inches. Sometimes two black wires about 4½ inches apart, stretched along the top of a fence, will catch and hang dogs trying to jump over.

Shooting.

Stock Inspector Madden, of Warialda, writes:—"The most successful method adopted has been the enclosing of one or a group of holdings within a high (5 to 6 feet) netting fence. By this means the dingo is shut out from the sheep country. He is then hunted by horsemen and the dingo is driven up to a line of shooters. . . . Occasional 'drives' are organised and take place over areas where the dingo is proving troublesome, and these often meet with success. This is the best and quicket method adopted."

It has been discovered by experience that this method is much more effective if the dogs are driven in the same direction as the wind is blowing, thus preventing the dogs from scenting the shooters.

Additional Remarks.

In the destruction of dingoes, most can be done in spring and summer, when the young and inexperienced pups are abroad. It has been suggested that dingoes could be infected with distemper, at the same time inoculating domestic dogs with protective serum. This method besides being extremely dangerous is unlawful and persons attempting to practise it are liable to prosecution. In districts where dingoes are present it is advisable to keep all domestic dogs chained up if there is any tendency to wander.

The practice of giving bonuses for scalps is highly commendable. It is adopted by Pastures Protection Boards of some districts, and in one case a Dog Destruction Association has been formed to encourage destruction and distribute bonuses.

In conclusion, always remember that while any dogs are present in the district war should be waged, owners should not wait till they suffer severe losses, but should be continually on the offensive.

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INFECTIOUS DISEASES REPORTED IN SEPTEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of September, 1928 —

Anthrax	Nil.
Blackleg	7
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	21
Swine fever	Nil.
Contagious pneumonia	1

—MAX HENRY, Chief Veterinary Surgeon

The Marketing of Pigs.

A. F. GRAY Senior Piggery Instructor.

REGARDING the marketing of pigs (other than stud pigs), the question as to whether it pays better to breed and sell pigs as porkers or bacon pigs depends upon local conditions generally, and also the distance from the centre where the animals are marketed. Whatever way the pigs are disposed of, it is very necessary that, before leaving the piggery, each pig for sale should be carefully fire-branded and the agent or factory manager advised accordingly, so that when the pigs arrive at their destination they are able to be distinguished and no errors are made regarding the ownership of the animals.

Importance of Branding.

This system of fire-branding would also be very beneficial for tracing diseased animals. This point should be stressed. for it is important that diseased animals should be traced and so clean up piggeries that are affected, and which may have had diseased pigs in the yard for some considerable time. At present there is a lot of trouble, especially tuberculosis, among pigs sent to factories, and this system of fire-branding would be helpful to the breeders and agents in clearing up trouble that may not otherwise be detected. The system is well worth adopting, for it enables the farmer also to clean up his herd and piggery, and improve the conditions generally on his farm.

To obtain the best market results it is necessary that the pigs should be of the correct type, well fed and topped off before being sent to the market, and the growing conditions so arranged that the pigs develop and arrive at the desired weights in a specified time. A system of grading should always be in operation on a pig farm, so that the different grades of pigs are kept in the various yards or small paddocks, and so get the proper amount of food that is allowed for each lot. Unless this grading system is carried out, the large pigs do not give the smaller ones a chance. The result is the pigs take longer to get into market condition, which means loss to the producer.

Guard against Bruising in Transit.

Careful handling in transit is another most important factor, for where pigs are bruised of whip-marked through careless handling, the results are not satisfactory. These bruises show out extensively on the carcase, and are oftentimes the cause of loss to the curer, and certainly not a paying proposition for the producer, who, it is urged, should exercise every care in the handling of the pigs from the time they leave his hands. Of course, the pigs may be bruised in railway trucks, but this cannot very well be obviated. Many of the losses with pigs, especially young ones—and in some districts these losses are heavy—are caused by the piggeries being erected on unsuitable sites, ineffective draining, houses devoid of warmth

and subject to draughts, and the matter of dry comfortable quarters not being provided for unfavourable weather. The housing so often seen is unsightly and insanitary, and not at all suitable for the production of well-grown healthy pigs.

Castration is another point worthy of attention. This should be carried out in good weather, under clean conditions, and when pigs are about four weeks old. The operation is then simple, and the pigs do not get the set-back in growth as is the case when they are done at a later stage. They also grow better and give a better appearance when marketed. It may be mentioned in conclusion—and this point is worthy of the attention of producers—that pigs are often held too long on the farm, and when marketed are over the profitable age limit, which renders them too fat and heavy, resulting in loss of revenue to the producer.

Produce your pigs to meet the general requirements of the market on which you deal, and when forwarding see that the animals are plainly fire-branded, preferably on the centre of the back just behind the shoulders. The agents or factory managers should be advised regarding the brands used in the consignment, and the pigs should be handled carefully in transit.

Treatment for Red Scale is Compulsory.

The attention of citrus-growers is directed to the Proclamation under the Plant Diseases Act, 1924, published in the *Government Gazette* of 14th September last, prescribing the treatment to be adopted for the prevention of red scale.

All owners and occupiers of any land or premises within the State on which is any infested lemon, mandarin, orange, kumquat, grape-fruit, lime or citron tree, are warned that it is now compulsory to take one of the measures laid down in the proclamation.

Every tree of any of the abovementioned species must be subjected to fumigation for at least forty-five minutes with hydrocyanic acid gas, generated under a cover of calico or canvas, in sufficient quantity to kill the scale, or spray every such tree with a mixture of miscible oil and water at a strength sufficient to kill the scale, and so that the spray comes in contact with every part of the tree.

A New Quarter-bushel Peach Case.

Following upon representations made by the New South Wales Fruit-growers' Federation that an additional quarter-bushel case should be introduced to allow of the more suitable packing of large peaches, the Minister for Agriculture recently gave the necessary approval for this to be done, and provision has been made in a new regulation, which was gazetted under the Fruit Cases Act, 1912, in the *Government Gazette* of the 14th September last, to incorporate the additional quarter-bushel case, having inside measurements of 11¾ inches long by 9 inches wide by 5¼ inches deep.

The quarter-bushel cases previously provided for have been retained in the new regulation.

Grazing Trials on Top-dressed Pastures.

SECOND YEAR'S RESULTS AT MILVALE, PARKES, AND MILBRULONG.

J. N. WHITTET, H.D.A., Agrostologist.

IN order to ascertain the residual effect of the applications of superphosphate made on certain holdings in 1926, the trials were continued for a further twelve months (during the 1927-1928 season) without any additional fertiliser being applied to the pastures. The history of the paddocks and the results obtained during the 1926-1927 stocking period of the trials were recorded on pages 891-899 of the December, 1927, issue of the *Agricultural Gazette.*

Milvale.

(Annual average rainfall at Stockinbingal for seventeen years, 18.42 inches.)

In the trial on Mr. W. P. Heffernan's property at "Glenoak," where a 240-acre paddock was subdivided into two areas of 140 and 100 acres, 84 lb. per acre of high-grade superphosphate was applied to the larger paddock during May, 1926. The pasture plants present at the commencement of the trials were Barley grass (*Hordeum murinum*), Annual Canary grass (*Phalaris minor*), Ball, Woolly, and Hop clovers (*Trifolium glomeratum, T. tomentosum* and *T. procumbens*) and Burr clover (*Medicago denticulata*).

During the first twelve months of the trial the top-dressed pasture was stocked at the rate of 2.9 sheep per acre, whereas the carrying capacity of the unmanured area was 1.4 sheep per acre.

The rainfall for the first eight months of the 1927-1928 trial was only 853 points; owing to the cold, dry winter, succulent feed was somewhat sparse in both paddocks. Green picking was available in fair quantity in the top-dressed area, but scarce in the unmanured paddock. The sheep in the latter were in good store condition when shorn, whereas many in the other paddock were fat. The local butcher selected 100 fat sheep out of the top-dressed paddock during August.

The feed gradually diminished from August to January, but the sheep in the top-dressed area kept in fair condition on the dry stems and seed pods of the clovers, and especially on the burrs of Burr clover which were present on the ground in large quantities; this material resulted from the response made to top-dressing the previous year by Ball clover and Burr trefoil

With the heavy rains experienced during the remaining period of the trial, a heavy growth of feed occurred in the top-dressed paddock, the ground being well covered and free from bare patches. The feed was slower to move in the unmanured area and the number of sheep was not increased to any considerable extent. More sheep had to be put in the top-dressed

area in order to cope with the feed, so that each paddock would finish with somewhat similar quantities of feed at the end of the second year of the trial.

The top-dressed paddock was practically free from saffron thistle, but in the unmanured section the thistle was on the increase. The composition of the paddocks at the completion of the two-year period is interesting, as it indicates that the fertilised pasture comprised an excellent variety and a well-balanced quantity of feed.

COMPOSITION of Pasture at Milvale.

Type of Plant.	Top-dressed.	Unmanured.
	Per cent.	Per cent.
Burr clover (*Medicago denticulata*)	35	20
Ball ,, (*Trifolium glomeratum*)	25	5
Star or Windmill grass (*Chloris truncata*)	25	25
,, ,, (*Chloris acicularis*)	10	10
Other miscellaneous fodder plants	4	5
Weeds	1	15
Bare patches	Nil.	20

It was estimated in April, 1928, that approximately one-fifth of the unmanured paddock was devoid of covering, whereas the top-dressed area was growing a good mat of feed.

Particulars of the stocking of the paddocks for the twelve months' period were as follows:—

STOCKING of Top-dressed and Unmanured Pastures at Milvale.

Month.	Sheep carried on 100 acres Unmanured.	Sheep carried on 140 acres Top-dressed.	Month.	Sheep carried on 100 acres Unmanured.	Sheep carried on 140 acres Top-dressed.
May, 1927	100	425	November ...	100	384
June	100	384	December ...	100	280
July	100	384	January, 1928 ...	50	210
August	100	425	February ...	125	420
September	100	425	March	125	420
October	100	425	April	125	560

These figures indicate that the residual effect of the fertiliser is very great in the second year; the carrying capacity of the unmanured area was one sheep per acre per annum, while that of the top-dressed pasture was 2.8 sheep per acre.

The rainfall records at Milvale for the period of the trial were:—

	Points.		Points.
May, 1927	35	December	32
June	64	January, 1928	390
July	135	February	420
August	107	March	428
September	134	April	294
October	113		
November	233	Total	2,385

Parkes.

(Average annual rainfall for thirty-eight years, 21.15 inches.)

This trial was commenced during June, 1926, 120 acres of country on Mr. H. K. Nock's property, at Nelungaloo, that had been out of cultivation for four years, being top-dressed with 56 lb. superphosphate per acre.

The plants most plentiful in the pasture were Star or Windmill grass (*Chloris truncata*), Barley grass (*Hordeum murinum*), Stinkgrass (*Eragrostis major*), Burr clover (*Medicago denticulata*), Ball and Woolly clovers (*Trifolium glomeratum* and *T. tomentosum*).

During the period 15th June to 31st December, 1927, only 748 points of rain were recorded, and feed was scarce. This scarcity was accentuated by the fact that the 1927 autumn and early winter rains were extremely light, and consequently the growth of winter grasses and burr clovers was sparse.

In October, 1927, the top-dressed paddock was slightly fresher looking than the unmanured section, but both carried very short feed, Barley grass and Burr clover being the only feed present.

The stocking of the paddocks for the twelve months period 15th June, 1927, to 14th June, 1928, was as follows:—

STOCKING of Top-dressed and Unmanured Paddocks at Nelungaloo.

Grazing Period.	Sheep carried on 120 acres Unmanured.	Sheep carried on 120 acres Top-dressed.
1927.		
June—14 days	1,000	......
,, —17 ,, ...	......	750
July and August—22 days	600	......
August—8 days	1,600	120
,, —16 ,, ...	......	90
September—20 days	......	90
,, —10 ,, ...	......	250
October—31 days	......	250
November—30 days	......	250
December—8 days	100	......
,, —31 ,, ...	......	250
1928.		
March —4 days	......	520
,, —25 ,, ...	100	......
April —30 ,, ...	100	520
May — 9 ,, ...	300	......
,, —21 ,, ...	......	360
June —14 ,, ...	......	360

In May, 1928, there was 50 per cent. more feed on the top-dressed area than on the unmanured paddock. The predominating plant in both paddocks at this stage was Stinkgrass (*Eragrostis major*), which comprised 90 per cent. of the pasturage. In the young stages of growth this grass is generally eaten by stock, but they do not relish it in the flowering stage or when it is mature.

For the twelve months' period, the top-dressed paddock carried at the rate of 1.6 sheep per acre, and the unmanured section 1.1 sheep per acre.

The rainfall at Nelungaloo for the period under review was:—

	Points.		Points.
June 15th to 30th, 1927 ...	32	January, 1928	332
July	15	February	544
August	40	March	161
September	136	April	131
October	156	May	70
November	242	June 1st to 14th	92
December	127	Total	2,078

Milbrulong.

(Average annual rainfall at Lockhart for twenty-nine years, 18.05 inches.)

At this centre an application of 84 lb. of superphosphate per acre was made to 80 acres of pasture in May, 1926, the pasturage consisting of Wallaby grasses (*Danthonia semiannularis* and *D. racemosa*), Barley grass (*Hordeum murinum*), Spear grass (*Stipa scabra*), Burr clover (*Medicago denticulata*), and Ball and Hop clovers (*Trifolium glomeratum* and *T. procumbens*).

Messrs. Gollasch Bros., in reporting on this trial to Mr. G. Bartlett, Agricultural Instructor, stated: "At the end of the season we marked 87 per cent. of lambs off top-dressed pasture and only 65 per cent. off country that had not received fertiliser. All the sheep on the top-dressed area last season were lambing ewes, and no hand feeding was necessary during last autumn. Since January, 1928, the top-dressed paddock carried 320 sheep, and at the end of the two-year period there was apparently enough feed present to carry them through till harvest time."

The following number of sheep were grazed on the paddocks during the period 17th May, 1927, to 16th May, 1928:—

STOCKING of Top-dressed and Unmanured Paddocks at Milbrulong.

Grazing Period.	Sheep carried on 80 acres Unmanured.	Sheep carried on 80 acres Top-dressed.
1927.		
May—15 days	120	400
June and July—14 days	......	780
August—14 days	700	780
September—30 days	300	780
October —26 ,, ...	300	......
,, —21 ,, ...	......	780
November —28 ,, ...	400	......
,, —30 ,, ...	......	500
December — 7 ,, ...	400	......
,, —14 ,, ...	......	500
1928.		
January — 7 ,, ...	......	500
February —29 ,, ...	200	320
March —31 ,, ...	200	320
April —30 ,, ...	200	320
May —16 ,, ...	200	320

The stocking of the two paddocks indicates that the carrying capacity of the top-dressed area was exactly double that of the unmanured paddock, the figures being 4.4 sheep per acre per annum and 2.2 sheep respectively. There was a marked increase in the growth of clovers and better quality grasses on the fertilised pasture as compared with the untreated area.

The rainfall at Milbrulong for the period of the trial was:—

	Points.		Points.
May, 1927 (17th-31st)	36	December	28
June	92	January, 1928	280
July	128	February	660
August	215	March	380
September	23	April	143
October	174	May (1st-16th)	40
November	38	Total	2,237

The Increased Carrying Capacity.

The following table shows the average carrying capacity per acre over the two years of the unmanured and the top-dressed pastures at each of the three centres, as well as the percentage increase in carrying capacity of the top-dressed over the unmanured areas for the same period:—

	Milvale.			Parkes.			Milbrulong.		
	Sheep per Acre.			Sheep per Acre.			Sheep per Acre.		
	1926-27.	1927-28.	Average for two years.	1926-27.	1927-28.	Average for two years.	1926-27.	1927-28.	Average for two years.
Unmanured area.	1·4	1·0	1·2	2·2	1·1	1·65	1·3	2·2	1·75
Top-dressed area.	2·9	2·8	2·85	3·5	1·6	2·55	3·6	4·4	4·0
Percentage Increase in Carrying capacity.	...	...	137·5	...	...	54·5	...	...	128·6

General Remarks.

The system of turning old wheat paddocks out to grazing as was the case with the Milvale and Parkes trials, and top-dressing with fertiliser increases the growth of clovers and increases the humus content of the soil. In addition, the heavy coating of sheep droppings present in paddocks which have to be heavily stocked to keep down the feed, considerably enriches the soil.

Superphosphate encourages a profuse growth of herbage, and this, together with judicious stocking, tends to reduce the prevalence of weed growth. In unmanured paddocks, weeds such as saffron thistle increase in number unless destroyed before seed is formed.

At Milvale, it was found that the rock salt placed in the top-dressed paddock lasted three times as long as that in the unmanured area, although twice the number of sheep was carried in the former.

The dry stems of Ball and Burr clovers, and the burrs of Burr clover (*Medicago denticulata*) proved a valuable standby when a shortage of green feed was experienced during the winter, spring, and summer months of 1927. The response made by these plants to superphosphate in 1926 was responsible for a heavy setting of seed. During December, 1927, and the early part of January, 1928, the only feed in the top-dressed paddock at Milvale was dry plants of the clovers and burrs of Burr clover, and in the other paddock the sheep had only dry growth of saffron thistle to feed upon.

The residual effect of even light applications of superphosphate is apparent two years after the application of fertiliser, and in districts such as those under review, an application of ¾ to 1 cwt. superphosphate per acre made in the autumn of every second year considerably increases the carrying capacity of the paddock at a very small cost. The main value of superphosphate lies in the fact that it encourages the growth and seed production of the better class pasture plants, and a general thickening up of the pastures results.

The trials are being extended to the 1928-29 season without further applications of fertiliser, in order to ascertain whether the residual effect of superphosphate is evident over a three-year period.

Wellingrove Seed Maize Test at Glen Innes Experiment Farm.

In order to encourage those farmers who are growing Wellingrove, which has become one of the most popular varieties of maize on the tablelands, the Department of Agriculture has arranged to conduct tests with different strains of seed at Glen Innes Experiment Farm. This will take the form of a yield test, and it is intended to sow seed of the various strains on a selected area at the experiment farm. The Department's Certificate will be awarded to the winner of the test.

Farmers who have devoted attention to seed selection and who, therefore, have good strains of the variety named, are invited to forward 5 lb. of seed to the Manager, Experiment Farm, Glen Innes, immediately. It will be necessary to limit the number of competitors to about twenty-five, and the Department also reserves the right of refusing any entry not sufficiently pure or true to type, so that the purity of seed at the farm will not be endangered.

Somewhat similar tests have been conducted in the past on the North Coast, and have proved of considerable value in improving the yielding qualities of maize, and have also been of considerable value to farmers by reason of the demand which has been created for seed. It is anticipated that similar results will be obtained from the test at Glen Innes.

Inquiries with regard to this test should be addressed to the Farm Manager, or to the Under-Secretary, Department of Agriculture, Sydney.

No other means has yet been found so efficient as the keeping of farm accounts to point a farmer's attention to possibilities of profitable improvements in his business.

Farmers' Experiment Plots.

Summer Green Fodder Trials, 1927-28.

The Northern District.

MARK H. REYNOLDS, H.D.A., and D. V. DUNLOP, H.D.A.

The following farmers co-operated with the Department in conducting summer green fodder trials last season :—

Maize and Sorghum Variety Trials—

H. Maloney, Scott's Flat.
Alford Bros., Scone.
V. Woods, Broke.
H. A. Wilson, Quirindi.
W. A. Hatcher, Lower Belford.
W. Foden, Whittingham.
J. Connell, Ravensworth.
H. G. Lambert, Singleton.
G. Ernst, Mitchell's Flat.
A. Robinson, Singleton.
A. J. Moonlight, Maerannie Station Estate, Singleton.

Sorghum Fertiliser Trials—

G. Ernst, Mitchell's Flat.
C. Beh, Mitchell's Flat.
Andrews Bros., Mt. Olive.
L. Dunford, Mt. Olive.
Manager, Maerannie Station Estate, Singleton.
Alford Bros., Scone.

Legume Variety Trials—

F. Kent, Singleton.
G. Ernst, Mitchell's Flat.
P. J. Freel, Middle Falbrook, via Singleton.
Manager, Maerannie Station Estate, Singleton.
H. Johnson, Sunnyside.
P. Short and Sons, Moore Park, Armidale.

The rainfall at the various centres during the fallow and the growing periods was as follows :—

Locality	Fallow Period.	Growing Period.
	Points.	Points.
Scott's Flat	258	1,586
Scone	727	1,537
Whittingham	840	3,037
Broke	666	2,107
Quirindi	198	1,716
Lower Belford	220	2,203
Ravensworth	157	2,217
Singleton	154	2,608
Mt. Olive	......	2,131
Mitchell's Flat (G. Ernst)	237	1,466
Mitchell's Flat (C. Beh)	225	2,284
Singleton (A. Robinson)	150 (early sown).	1,966 (early sown)
	626 (late sown).	1,382 (late sown).
Maerannie	133	2,900
Singleton (A. J. Moonlight)	660	1,754
Armidale	50	1,470

It will be seen that the rainfall was ample, but unfortunately it was not well distributed, heavy falls occurring in late summer and autumn after a fairly dry spell.

D

Sorghum and Maize Variety Trials.

Scott's Flat.—Deep alluvial, black medium loam; previous crop, maize; two plantings were made; for the first the land was ploughed in June 7 inches deep, ploughed twice again to 3rd November, harrowed and rolled after each ploughing; sown 5th November; for the second planting the land was ploughed 6 inches deep in early December, harrowed and sown 22nd December. Sudan grass was killed out by red stain, and White African sorghum was rather thin and went down most.

Scone.—Deep, alluvial, black medium loam; lucerne was ploughed-out in November, 1926, and maize was sown, used for green feed. Ploughed September, 1927, harrowed, ploughed November, cultivated twice and harrowed; sown 19th January, 1928. Selection 61 and Collier lodged badly and no weights were obtained.

Broke.—Deep, alluvial, sandy soil; previous crops, oats and sorghum, unmanured; ploughed June, 1927, 9 inches deep, harrowed and ploughed again 9 inches deep, harrowed just prior to sowing, on 8th December. Good stand obtained, cultivated once between rows.

Quirindi.—Deep, black alluvial loam; previous crop, oats, unmanured and fed off; ploughed 8 to 9 inches deep early in September, cultivated early in October 4 inches deep, harrowed 4th November; sown on 10th November. Owing to dry weather, maize was practically a failure. Selection 61 lodged and was the poorest of the sorghums. Harvested 7th May, 1928.

Lower Belford.—Alluvial black medium loam. Previous crops, maize in 1926, unmanured, followed by barley, unmanured, for green feed, and maize for grain. Two sowings were made, the first on 7th November, for which the land was ploughed early in May to a depth of 9 inches, rolled July, ploughed and rolled September, and the second on 7th December for which the land was ploughed October-November 8 to 9 inches deep, harrowed and rolled. The first-sown plots were scuffled three times, the later-sown twice, the last being a hilling. Fungous diseases were in evidence and reduced the yield more than usual. Harvested 25th April (second planting).

Whittingham.—Alluvial to medium sandy loam; previous crop, potatoes, unfertilised, which were washed out by flood; ploughed February, 1927, 6 inches, harrowed and sown with Saccaline which failed; ploughed June 8 inches and harrowed, ploughed September and harrowed. Two sowings were made, first 21st October and the second 22nd December. No results were obtained from the first sowing as the plots were very patchy and uneven due to flood washings. Sudan grass from the second sowing was killed out by red stain after one cut had been obtained.

Ravensworth.—Sedimentary, deep sandy loam; previous crop, barley, fertilised, and fed off from time to time; ploughed 31st August (dry), harrowed 7th September, ploughed 8th September 7 inches deep, springtoothed two days before sowing. Sudan grass was spindly and thin, badly affected with red stain, crop not weighed. Selection 61 matured first, but was the poorest of the sorghums. Harvested 2nd May, 1928.

Singleton (H. G. Lambert).—Deep, alluvial, sandy loam; previous crop, maize and sorghum, unfertilised; maize ploughed mid-September 9 inches, harrowed October, ploughed 16th November 6 inches and harrowed; sorghum section ploughed mid-November and harrowed, ploughed again end of December 8 inches, and harrowed and cultivated. Sown 6th January; harvested 27th April.

Mitchell's Flat.—Deep, black, alluvial loam; previous crop, pumpkins, unfertilised, in 1926; ploughed July, 1927, 9 inches deep, ploughed August, 9 inches, and again 6th October; rolled, disced and rolled after each ploughing; sown 7th November. A good germination of all varieties was obtained. Inter-row cultivations were carried out during November, December, and January. Selection 61 grew tallest—up to 9 feet—but the stand was thin. Saccaline grew to 7 feet and was a fair stand; it produced very few heads. Harvested 24th February.

YIELDS of Summer Green Fodder Variety Trials.

Locality.	Collier.	Saccaline.	White African.	Selection 61.	Sumac.	Fitzroy.	Funk's Yellow Dent.	Leaming.	Golden Superb.	Sudan Grass.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
	1st sow.	1st sow.	1st sow.							
Scott's Flat ...	24 11	22 11	33 9	25 4	.	23 4	17 0	23 8	15 0	27 9
	2nd sow.	2nd sow.	2nd sow.							
	22 0	26 0	2[illegible] 0							
Scone	...	30 0	...	...	.	.		...	..	...
Broke	29 3	25 9	28 4	21 1	..	..	..	...	...	...
Quirindi ...	23 10	24 0	18 10	13 10	.		.	...	...	...
Lower Belford ..	E. sow.	E sow	E sow.	E. sow.		E. sow.		E. sow.		E. sow.
	28 19	31 11	29 16	22 16	...	20 4		15 7	...	11 18
	L. sow.	L sow	L. sow.	L. sow.						L. sow.
	14 0	16 0	19 0	11 10	..	..	..	...	...	11 2
Whittingham ...	11 0	11 0	9 0	9 0	..	.	..	...	...	8 10
Ravensworth ...	19 10	16 10	14 4	11 0	..	...	.	...	..	...
Singleton (H. S. Lambert.)	22 10	24 10	25 4	18 0	...	...	.	...	..	...
Mitchell's Flat ...	14 0	13 9	11 12	9 4	...	11 15	.	10 16	...	8 5
Singleton (A. Robinson.)	E. sow.	E. sow.	E. sow	E sow.		E sow.		E. sow.		E. sow.
	25 0	32 0	40 0	28 0	..	22 0	...	20 0	...	38 0
	L. sow.	L. sow.	L. sow.	L. sow.						L. sow.
	29 10	33 12	33 5	31 11	..	...	...	...	...	7 0 (1 cut.)
Maerannie ...	28 5	24 10	35 10	..	14 0			.		7 0

Singleton. (A. Robinson).—Deep, black, alluvial soil, sandy to loamy' First section: previous crop, oats, which were fed-off; ploughed 15th May' 8 inches deep, harrowed mid-June, ploughed end of June, 6 inches deep, harrowed mid-July and rolled, springtoothed last week in August. Second section: old lucerne stand ploughed 1926 and sown with oats; ploughed in October, 6 inches deep, harrowed and rolled, ploughed 10 inches deep in November, harrowed and rolled. Two sowings were carried out, the first on 1st November and the second on 3rd December. In both cases germination was very good and excellent stands resulted. Inter-row cultivations and hoeings were given, and the crop was practically weed-free. Harvesting was carried out 20th February and 23rd April, when an average height of 10 feet was reached, Saccaline being tallest, reaching 11 feet. The late-sown Sudan grass did not make satisfactory growth after the first cut.

Maerannie Station Estate.—Soil, sandy, deep, alluvial loam; previous crop, oats, fed-off green; ploughed in November, 8 inches deep, and harrowed, ploughed January, harrowed, and sown 11th January. Several inter-row cultivations were given. White African showed the best stand from the first. Plots were harvested 30th April.

The Sorghum Fertiliser Trials.

Mitchell's Flat (G. Ernst).—Soil black, deep alluvial loam; previous crop maize for grain, unfertilised; ploughed 9 inches deep in June, rolled and disc-harrowed in July, ploughed in August 9 inches and disced, ploughed in October 6 inches and disced. Sown on 8th November, 1927, with Collier sorghum at the rate of 8 lb. per acre. Germination was very good; M16 showed up, the crop being slightly taller in the early stages.

Mitchell's Flat (C. Beh).—Soil deep alluvial, black, medium loam. Previous crop, maize for grain, unfertilised; ploughed mid-June 6 inches deep, again ploughed end of October, rolled and harrowed just prior to sowing which was carried out on 16th November, Saccaline being the variety. M16, M23 and M30 showed out favourably throughout the growing period.

SORGHUM Fertiliser Trials.

Fertiliser.	Mitchell's Flat (G. Ernst, Collier).		Mitchell's Flat (C. Beh, Saccaline).		Mt. Olive (Andrews Br. W. African).		Mt. Olive (L. Dunford, Collier).			Maerannie (Selection 61)		
	Quantity of fertiliser per acre.	Yield.	Quantity of fertiliser per acre.	Yield.	Quantity of fertiliser per acre.	Yield.	Quantity of fertiliser per acre.	First Sowing.	Second Sowing.	Quantity of fertiliser per acre.	Yield	Second (White African)
	lb.	t. c.	lb.	t. c.	lb.	t. c.	lb.	t. c.	t. c.	lb.	t. c.	t. c.
M23	124	16 13	168	25 7	193	5 7	125	20 13	17 9	191	21 16	39 5
M16	132	20 4	168	29 0	187	7 11	185	19 1	18 13	209	27 0	32 0
Superphosphate ...	88	18 19	..	24 5	127	4 16	96	21 17	21 1	147	23 10	30 2
Blood and bone ...	110	18 0	168	19 13	165	7 1	119	20 13	19 1	181	27 6	34 8
M30	139	17 0	168	25 7	230	6 13	164	21 17	21 1	249	30 0	27 2
No manure ...	...	18 19	..	24 5	...	4 18	...	20 5	18 13	...	22 6	30 15

NOTE.—M23 fertiliser mixture consists of 10 parts superphosphate 3 parts sulphate of potash; M16 5 parts superphosphate and 2 parts sulphate of ammonia and M30, 10 parts superphosphate, 4 parts sulphate of ammonia, and 3 parts sulphate of potash.

Mt. Olive (Andrews Bros.).—Soil sandy, deep alluvial loam; previous crop, Sudan grass, unfertilised, fed off; land ploughed 6 to 7 inches deep in June, again in July, and frequently harrowed to kill weeds; ploughed again August and harrowed, cultivated 3 to 4 inches deep in November and harrowed; sown 15th November with White African seed. Subsequent cultivations consisted of two harrowings after the crop was well up and one inter-row cultivation on 3rd January. Harvested 3rd June, 1928.

Mt. Olive (L. Dunford).—Soil, black alluvial loam; previous crop, oats, unfertilised, used for green feed; ploughed 7th September 6 inches deep, cultivated twice in October, heavy harrowed prior to planting; sown 10th

November with Collier sorghum. Superphosphate alone proved the most profitable fertiliser. Harvesting was carried out on 27th April, when plots had reached a height of 16 feet.

A second sowing with the same variety and fertilisers was made on 28th December, the results obtained being very similar to those of the first sowing.

Maerannie.—Soil, deep, light sedimentary; previous crop, oats for green feed, to which superphosphate had been applied at 100 lb. per acre; ploughed June, springtoothed July to 7 inches, harrowed, ploughed in August 7 inches deep and harrowed, ploughed in October, springtoothed and harrowed; sown 10th November with Selection 61. Harvested 30th April, 1928.

Scone (Alford Bros.).—Soil, deep, alluvial, black medium loam, lucerne ploughed out in November, 1926, maize sown without fertiliser and fed off; land ploughed in September 9 inches deep, cultivated and harrowed in November, cultivated twice, harrowed and sown 19th January; variety, White African. Harvested 4th May, 1928.

Legume Variety Trials.

Singleton (F. Kent).—Deep, sandy alluvial light loam, old pasture land not previously cropped; ploughed autumn, 1927 (after Easter rains), ploughed again and cultivated just prior to sowing on 11th November. Seed was planted in rows 2 feet 6 inches apart; one inter-row cultivation was given. Harvested 9th April. Mr. Kent fed hay of all varieties to pigs which readily eat it.

Mitchell's Flat (G. Ernst).—Soil, black, deep medium alluvial loam; previous crop, pumpkins; ploughed July 9 inches deep, ploughed August 9 inches and again in October 6 inches deep; rolled, disced and rolled after each ploughing. Sown 7th November in rows 30 inches apart. P11 fertiliser was applied at the rate of 123 lb. per acre. Crop was inter-cultivated 25th November, and hilled 17th December.

The Velvet beans were too intertwined for the weights to be taken, but the growth was as good as that of Black cowpeas.

Middle Falbrook.—Soil, alluvial, silt; previous crop, oat fertiliser trial, fed off; ploughed 6 inches deep on 8th September, and harrowed; sown 17th September in drills opened 3 inches deep and 2 feet 6 inches apart. The following varieties were sown at the rates indicated :—

Otootan soybeans, 24 lb. per acre; Poona soybeans, 21 lb.; Black cowpeas, 24 lb.; Biloxi soybeans, 24 lb.; Haricot field beans, 30 lb. P11 fertiliser was applied at the rate of 125 lb. per acre

Biloxi appeared the best soybean. Haricot beans are very quick growers and early maturers. During the dry spell to November most of the plots dried off, particularly the cowpeas, and green weights were not obtained.

Maerannie.—Soil, sandy, deep, light alluvial loam; previous crop, Saccaline, unfertilised; ploughed July 6 inches deep, springtoothed 8th September 6 inches, rolled September, ploughed 15th September, springtoothed 28th

September; sown 30th September in drills 30 inches apart. Owing to wet conditions green fodder weights were only obtained from Biloxi and Otootan soybeans.

Sunnyside.—The primary object of this experiment was to discover the most suitable legume for rotation with maize, but all plots were spoilt by heavy rain and no weights were obtained.

YIELDS in Legume Variety Trial.

Variety.	Singleton (F. Kent).		Mitchell's Flat. (G. Ernst).		Maerannie Station.		Armidale.	
	tons.	cwt.	tons.	cwt.	tons.	cwt.	tons.	cwt.
Black cowpeas	22	5	6	9	......		..	
Poona cowpeas	21	4	9	14	......		...	
Biloxi soybeans	10	2	4	14	9	0	...	
Otootan soybeans	11	18	3	15	10	0	.....	
Haricot beans	......		4	19	.....		..	
Velvet beans	10	17	......		.....		...	
Lupins	......		......		......		8	2
Grey field peas	......		......		.....		5	3

Armidale.—Soil, basaltic brown to grey, medium to heavy loam; previous crop, maize, unfertilised; ploughed August 7 inches deep, cultivated 4 inches deep in October; sown in drills 3½ inches deep and 2 ft. 6 in. apart opened with plough. On 4th October the varieties were sown at the following rates:— Otootan soybeans, 22 lb. per acre; Haricot field beans, 46 lb.; Greenfeast peas, 68 lb.; Grey field pea, 51 lb.; field lupins, 34 lb. The plots were planted in duplicate; one being fertilised with P11 at 148 lb. per acre, and the other not fertilised. Throughout the growing period the unfertilised plots were not equal to the fertilised. Rabbits eat out the soybeans, and rain spoilt the others, although all had made good growth. Unfortunately weights were only obtained from the field lupins and Grey field peas.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Murwillumbah (Thos. M. Kennedy)	Nov.	28, 29
Grafton Summer Show ..	Dec.	7, 8

1929.

St. Ives (F. Clarke) ..	Feb.	8, 9
Leeton (W. Rosewarn) ..	,,	12, 13
Castle Hill (W. H. Taylor)	,,	15, 16
Newcastle (E. J. Dann) ..	,,	19 to 23
Blacktown (A. J. Greenaway) ..	,,	22, 23
Maitland (M. A. Brown) .	,,	27, 28, Mar. 1, 2
Moss Vale (W. Holt) ..	,,	28, Mar. 1, 2
Tumut (H. Mount)..	Mar.	5, 6
Cessnock (G. Bidgery) ..	,,	6 to 9
Campbelltown (W. N. Rudd) ..	,,	8, 9
Gundagai (P. J. Sullivan) ..	Mar.	12, 13
Batlow (C. S. Gregory) .	,,	12, 13
Mudgee (O. Wilkins) ..	,,	14, 15, 16
Goulburn (T. Higgins) ..	,,	14, 15, 16
Kempsey (E. Mitchell) ..	,,	19, 20, 21
Wallamba (E. A. Carey) ..	,,	21, 22
Wingello (J. E. Creelman) ..	,,	28
R.A.S., Sydney (G. C. Somerville)	,,	27 to Ap. 6
Orange (G. Williams) ..	April	16, 17, 18
Grafton (L. C. Lawson) ..	,,	17 to 20

A Mechanical Maize Picker.

L. S. HARRISON, Special Agricultural Instructor.

REALISING that there is an urgent demand for an increased acreage return to offset high production costs, farmers are beginning to recognise the advantages to be gained by the use of machinery in assisting them to attain that object.

The mechanical maize picker is such a machine, and it has been claimed that it is meeting a big demand from maize-growers in other countries, seeing that it makes available to them a method of harvesting that eliminates pulling and husking by hand, and for that reason alone it is considered of sufficient importance to justify the expenditure necessary for its purchase. Under New South Wales' conditions, however, it would be obviously unwise for a grower to procure a machine when he only has a small area, but for the growers in the inland maize districts there should be much to interest them in the description of the machine which is given hereunder. On the coast maize is customarily, and advisedly, harvested in the husk, and the individual areas are too small to warrant the purchase of a machine as a business proposition.

A maize picking and harvesting machine was imported into Australia by the Victorian Department of Agriculture to test it out in the large maize-growing areas of Orbost and Lindenow.

The writer saw the machine operating under actual field conditions in a light crop, which yielded about 35 bushels to the acre. Weeds (milk thistle, mustard, and trefoil) were thick, and in the middle of June were sufficiently dense to keep the ground and stalks wet and tough throughout the day. The picker was originally intended to be used with the elevator loading direct into a box wagon which is pulled along at the picker's side, but the substitution of a platform to hold about eight bags of cobs was found to be a distinct advantage, eliminating the need for a wagon and team, and permitting of the bags being taken off and stacked at convenient collecting points.

It is possible to work the machine with horses, but this course cannot be recommended as the power required is comparatively high and the rate of progress when horses are used is too slow. At Lindenow a 10-20 h.p. tractor was used with a power take-off, and the outfit worked quite satisfactorily.

The crop was planted with rows 3 feet apart, and the machine worked in lands and picked and husked the cobs very efficiently. When the stalks were bent down and away from the row the cobs were all collected, and only in the case of a stalk lying lengthwise along the row, and in the same direction as the machine was working, were cobs missed. If the crop is harvested on the green side some of the grain is bruised by the husking rollers, and, on the other hand, if the crop is very dry a little of the grain is shelled, but this is no great fault as it is collected by the elevator buckets. With the tractor outfit the machine travels about 3 miles per

hour and operates on one row at a time. The design is similar to a maize binder in its method of approaching the crop, but having two knobbed rollers revolving between the guides, and these pull the cobs from the stalk and carry them up by means of these rollers working on the screw conveyor principle. The cobs in the husks are then directed to a set of four pairs of husking rollers on which are short spikes to catch and remove the husks, the cobs being retarded by four spring actuated plates whilst the rollers are removing the husks. The cobs are then conveyed by means of an elevator to the bagging platform.

Machine Showing Elevator Spout and Bagging Platform.
[*G. Maggs, Melbourne.*]

The crop in which the machine was seen operating, was uneven in maturity, and whilst some cobs were dry others were very immature. The machine is not unduly complicated in construction, and, although some of the quicker-moving parts are light, it will be seen that a fast rate of depreciation or short working life has been allowed for in the following costs, probably quite in excess of what might occur under actual working conditions. Figures for depreciation must always be somewhat hypothetical and dependent upon the user's individual treatment.

The following sets of figures are taken from actual field tests, and have been certified to by representatives of the Victorian Maize-growers' Committee and the Department of Agriculture.

RESULT of Mechanical Maize Picker Trials.

	Orbost Trial.	Lindenow Trial.
Actual time worked	**3½ hours.**	**3½ hours.**
Bags (105 lb. each) harvested ...	**169**	**96**
Labour	**£2 5s. 0d.**	**15s. 3d.**
Fuel	**8s. 10½d.**	**9s. 1½d.**
Estimated yield of crop	**92 bus per acre.**	**35 to 40 bus. per acre.**
Cost per bag to harvest	**3⅜d.**	**3d.**

Now add depreciation and upkeep charges on the machine, estimated as follows:—Working life of fifty days per year for each of four years, equals

200 days, and for a machine valued at £230 (new) this works out at 23s. per working day. Add to this interest at 6 per cent., which amounts to £35 over four years or 3s. 6d. per day, and this added to the depreciation charge of 23s. makes a total of 26s. 6d. per day for the working life of the machine. On the same basis, a tractor valued at £395 with a life of 150 working days per year for each of four years, depreciation and interest work out at something like 15s. per working day. Now adding the two—depreciation and interest on machine and tractor—we get 41s. 6d. per day additional to be added to the harvesting costs, which for the half-day's work in the case of the Orbost and Lindenow trials runs out at 1½d. and 2½d. per bag respectively, making the total cost per bag of harvesting with a tractor-operated mechanical maize picker 5¼d. in the Orbost trial and 5½d. in the Lindenow trial. By the foregoing it will be seen that such a machine merits close consideration by growers of large areas of maize in inland districts.

To Prevent the Rusting of Kerosene and Petrol Tins.

Writing to the Chief Veterinary Surgeon, of the Department, Mr. Andrew D. Mathews, of Maryantha, Cobar, gave the following information as to how to prevent the rusting of kerosene and petrol tins :—

"When you were here in 1924, I was treating kerosene tin blowfly traps with stock tar to preserve them from corrosion. I since find a more simple and effective preservative is common fat or tallow. When the kerosene or petrol tin is prepared for use as a trap, about a half cup of fat is put in the tin, and the tin is heated over a fire causing the fat to run into the corners and partly up the sides. A swab may be used to apply the fat to the outside of the tin, painting the bottom and about half-way up the sides. I have tins treated this way and they are in their second year of use. The fat does not "lift" as other paints do when in constant contact with moisture. Tins which contain American brands of petrol appear stronger than those containing other brands. A leaky tin is certainly easy to replace, but it is annoying to find a trap out of action because of a rusty tin which has been in use but a few months. That means a day or more lost placing a new tin in position when probably the flies are most active. Painting with fat will cause the tin to last through the season."

A Tank Stand.

A suitable stand for a tank can be made by filling a ring of corrugated iron with sand. The ring should, of course, be well riveted, and it is also advisable to further strengthen it by means of hoops of fencing wire twitched up hard against the iron.

The greatest pressure on the floor of the tank will be about its centre, and it is advisable, therefore, to give the sand filling a slight crown at the centre so that the tank, when full, will settle with a level floor. The life of the floor of the tank, and also of the ring of galvanised iron will be greatly extended if the surfaces coming in contact with the sand are given a wash of cement.—N. L. Jones, Supervising Architect.

White Maize Competition, 1927-28.

L. S. HARRISON, Special Agricultural Instructor.

ARRANGEMENTS were made by the Department last season to carry out competitions in co-operation with local agricultural societies and the Royal Agricultural Society. The competitions were judged by the Department's Agricultural Instructors, and Messrs. Kellog (Australia) Propriotary, Ltd., of Sydney, donated £120 in prize money, £30 to be allotted to each of the four district competitions.

For the purpose of the competition, the State was divided into four districts, namely, Upper North Coast, Lower North Coast and Central Coast, South Coast, and Tumut-Gundagai district—the Northern Tableland being omitted for the season 1927-28.

The points awarded in the different district competitions are published hereunder:—

RESULTS of White Maize Competition, 1927-28.

Competitor.	Cultivation (Max., 25 points).	Germination and Stand (Max., 10 points).	Condition and Evenness (Max., 10 points).	Freedom from Insect Pest and Disease (Max., 10 points).	Purity and Trueness to Type (Max., 15 points).	Estimated Yield (3 points for each 10 bushels per acre).	Total.	Suitability for Manufacture (Max., 15 points).	Grand Total.	Variety.
No. 1 District.—Upper North Coast.										
M. McBarron, Raleigh No. 1 ..	20	8	9	8	12	30	87	7	94	Silvermine.
M. McBarron, Raleigh No. 2 ..	21	7	6	7	8	15	64	10	74	Hickory King.
R. Grace, North Dorrigo ...	23	8	8	8	14	21	82	9	91	Own selection.
J. M. Johnson, Condong ...	24	8	7	8	12	24	83	9	92	Giant White.
No. 2 District.—Lower North Coast and Central Coast.										
Davis Bros. (P. J. Davis, Taree).	24	10	9	8½	11	40	102½	9	111½	Hickory King.
J. P. Mooney, Manning River	21½	8	9	6	11	42	97½	9	106½	,,
W. E. Ward, Macleay River...	19½	8	7½	9	12	36	92	5	97	Giant White.
J. Kernahan, Pampoolah ...	19	8	8	7½	11½	33	87	6	93	Hickory King
C. Smith, Macleay River ...	22	6½	8½	8	11	30	86	4	90	Giant White.
F. W. Flett, Manning River...	21	7	7½	9	12	24	80½	5	85½	Hickory King.
No. 3 District.—South Coast.										
J. Keenan, Kangaroo Valley ..	24	9	9	9	12	32	95	11	106	Hickory King.
F. W. Madge, Kangaroo Valley.	23	9	8	9	11	33	93	11	104	,,
W. Caffery, Nowra	24	9	7	9	10	36	95	8	103	,,
T. H. Nelson, Kangaroo Valley.	22	8	8	8	13	27	86	12	98	,,
W. Cole, Pambula	21	8	8	9	14½	24	84½	11	95½	,,
J. Chittick, Kangaroo Valley..	20	9	8	8	14	33	92	3	95	Boone County.
C. Haigh, Pambula	20	9	8	9	12	21	79	12	91	Hickory King.
L. D. Collett, Moruya ...	23	8	9	9	13	25	87	4	91	Giant White.
H. O. Cox, Kangaroo Valley ..	20	9	8	8	14	22½	81½	8	89½	Hickory King.
M. P. Brennan, Kangaroo Valley.	24	9	8	9	12	18	80	8	88	,,
Squire Robertson, Wyndham	20	8	8	9	13	24	82	3	85	,,
No. 4 District.—Tumut-Gundagai.										
W. Butler, Tumut	21½	8	8	8	12	30	87½	6	93½	Murrumbidgee White
C. Campbell, Tumut	21	6½	7½	8	10½	33	86½	7	93½	,,
W. Scheuner, Gundagai ...	23	7½	7	7	10	33	87½	6	93½	Manning Silvermine.
J. R. Johnston, Tumut ...	22	7	7	8	10	33	87	5	92	Murrumbidgee White.
Brown and Davis, Tumut ...	22½	7	6	8	10	33	86½	5	91½	Hickory King.
Execs. of H. L. Harris, Tumut	20	7	7	8	11	33	86	3	89	Iowa Silvermine.
W. E. Bridle, Tumut ...	20½	8	7	8½	11	24	79	2	81	Murrumbidgee White

Scale of Points for Judging.

The scale of points used in judging these competitions provided for points being allotted at three different stages, viz., at tasselling stage for germination, cultivation methods, condition, appearance, &c.; at the ripe or harvesting stage for estimated yield, purity and trueness to type, and freedom from insect pests and diseases; and finally after the grain had been harvested for suitability of the product for manufacturing purposes, Messrs. Kellog (Aust.) Pty. Ltd. making these tests.

Remarks.

In the Lower North Coast and Central Coast, South Coast, and Tumut-Gundagai districts the interest in the competitions was very keen and widespread. Many more entries were received than reached the final judging. In the Upper North Coast no competitions were arranged by the local agricultural societies, but several individual entries were received and accepted, and special prizes allotted.

Science and Modern Farming.

In 1898 Sir William Crookes predicted that the world in 1931 would require 90,000,000 tons of wheat to feed its population, and that this represented the utmost the world could produce. After that the world would be faced with starvation. The advance of science in agriculture has upset that calculation. Sir William Crookes' limit was exceeded in 1911, and could be enormously increased to-day. The fear of world starvation has fled before the advance of science. The problem before the world now is to ensure that the farmer shall get his fair share of the profit so as to encourage him to use all the knowledge that science can teach.—Sir John Russell, Rothamsted Experimental Station.

College Students Desirous of Gaining Farm and Station Experience.

On completion of the Hawkesbury Agricultural College Diploma Course in Agriculture at the end of the year, several students are desirous of gaining further practical experience on stations or farms. These lads, about 19 to 21 years of age, have obtained a thorough grounding in the theory and practice of agriculture during the three years they have been in residence, and can be recommended to station owners and farmers desiring their services.

Should any farmer or pastoralist be desirous of obtaining the services of any of these lads he should communicate with the Principal, Hawkesbury Agricultural College, Richmond.

Also, during the midsummer vacation (13th December, 1928, to 26th January, 1929, inclusive) some of the College students are anxious to gain practical experience on approved farms. These students are about 17 to 20 years of age, and the Principal would be pleased to hear from any farmer or grazier who is able to place one or more of these students.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Potatoes—	
Brownell's	J. B. Howell, Glen Innes.
Carman	Johns Brothers, Strathalbyn, Myrtleville.
	M. Hoare, Myrtleville.
Early Manistee	J. J. Cusack, Stonequarry, Taralga.
Factor	R. E. Ball, Stonequarry, Taralga.
	E. McAlister, Richlands, Taralga.
	J. J. Cusack, Stonequarry, Taralga.
	N. C. Peters, Pinnacle Road, Orange.
Great Scott	J. B. Howell, Glen Innes.
Langworthy	N. C. Peters, Pinnacle Road, Orange.
Satisfaction	J. J. Maloney senior, Stonequarry, Taralga.
	M. Hoare, Myrtleville, Taralga.
	C. N. Hillen, Taralga.
Scott's Satisfaction	J. B. Howell, Glen Innes.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Sunnybrook Earliana ...	A. E. Johnson, Green Valley, via Liverpool.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Sudan Grass	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
White African	Under-Secretary, Department of Agriculture,
Saccaline	Manager, Experiment Farm, Lismore.
	D. P. Shearer and Sons, Glendon, Scott's Flat, Singleton.
Collier	Manager, Experiment Farm, Grafton.
Cowper (late Selection No. 61)	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Thoroughly wash and scald all clothes, strainers, milking and dairy utensils, using only pure water for the purpose, and discard any utensils which, owing to rust or other defects, are liable to retain dirt or traces of milk.

Farm Forestry.

V.—The Native and Introduced Trees of New South Wales.

[Continued from page 774.]

R. H. ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE WESTERN SLOPES DIVISION.

The Western Slopes Division includes not only a fairly large area of the State, but covers important agricultural, pastoral and forest areas in which the question of tree growth demands careful attention.

Roughly speaking, this division includes all the slopes on the western side of the Dividing Range, and is bounded on the west by the Western Plains divisional line referred to in a previous section of this article. The eastern boundary line consists of a contour line varying from 2,000 feet elevation in the south, to 2,500 feet in the north, although occasionally falling below these altitudes to exclude some bleak and exposed districts which are better placed in the Tablelands Division. In the basin of the Hunter River the Western Slopes Division adjoins the Coastal Division without the intervening tablelands which separate the two divisions at all other points. In this portion the eastern boundary is represented by approximately the 25 inch rainfall line, and includes such districts as Muswellbrook, Scone, and Denman, which climatically and vegetatively exhibit many of the characteristic features of the Western Slopes.

The whole division may, with advantage, be subdivided into three sections, viz., northern, central and southern subdivisions, in which geographical distinctions are reflected to some extent in variations in climatic conditions and types of tree flora. The northern subdivision extends from the Queensland border and is bounded on the south by a line passing a little north of Murrurundi and Binaway. It includes the Tamworth Land Board District, a small part of the Moree Land Board District, chiefly in the neighbourhood of Warialda and Bingara, and the Inverell portion of the Armidale Land Board District. The more important centres include Warialda, Barraba, Tamworth, Quirindi, Gunnedah and Coonabarabran. The rainfall is fairly evenly distributed throughout the year, but occurs mainly in the summer months, the average annual rainfall varying from 24 inches at Gunnedah to 31 inches at Bingara. Periods of drought are not infrequent, the rainfall falling as low as 12 to 15 inches. The range of temperature is fairly considerable in this as well as the other subdivisions.

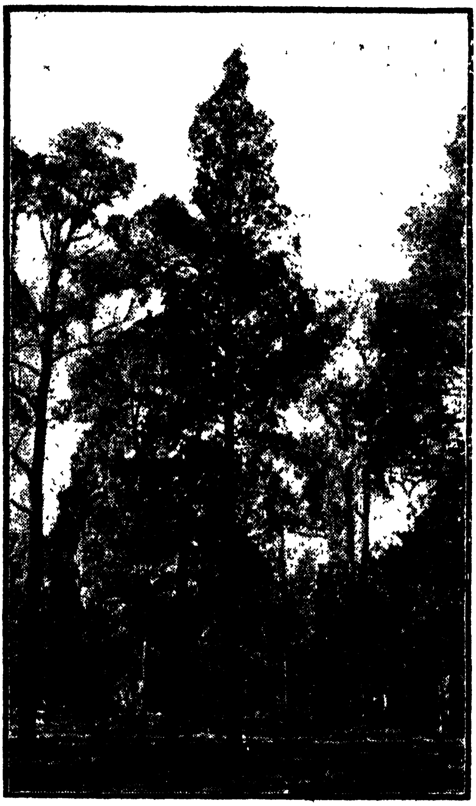
The central subdivision is bounded on the south by a line just north of Narrandera and Cootamundra, and includes the Upper Hunter Valley within its eastern border. Portions of several Land Board Districts are included, but, generally speaking, the Forbes Land Board District is representative of the subdivision. Scone, Merriwa, Mudgee, Dubbo, Wellington, Forbes, Wyalong, and Young may be regarded as type districts. The

rainfall is more or less evenly distributed throughout the year, the average annual rainfall varying from 18 inches at Wyalong to 28 inches at Molong. During drought years, however, the rainfall may fall as low as 10 inches.

The southern subdivision continues from the southern boundary line of the central subdivision to the Victorian border. The principal centres are represented by Junee, Wagga, Albury and Tumut. The average annual rainfall varies from 21 inches at Wagga to 31 inches at Tumut, but in bad years, in the drier parts, falls as low as 12 inches.

General Features of the Division.

Topographically, the Slopes Division includes hilly, undulating and plain country, the hilly portion occurring principally in the eastern portion on the lower slopes of the Dividing Range, but also in more or less isolated sections of the western portions, as, for example, at Coonabarabran. Geological formations show a fairly wide range with a corresponding difference in soil types. The latter may broadly be classified as deep, reddish, sandy loams, light sandy loams, very poor, white, sandy soil, sandstone ridges with stony outcrops, clayey soils, black soils, and heavy alluvial soils or flats.



Cypress Pine (*Callitris robusta*) and Ironbark (*Eucalyptus crebra*).

Originally the division was fairly well wooded with good timber trees. Building and fencing materials supplied by the Cypress Pines, Ironbark and Boxes have been of great assistance in the progress of settlement, apart from their commercial value on the ordinary timber market. In many parts, however, particularly in the great wheat belts, extensive clearing has been carried out, although valuable areas have been set apart for forestry purposes. In some cases all standing trees have been removed, particularly on wheat areas where the sapping effect of Eucalypts may result in decreased crop production, but elsewhere scattered trees of species such as Kurrajong are left standing in the paddocks. In many places there appears

to be a great need for efficient breakwinds and shelter trees, a large number of homesteads being without shelter or shade of any description, especially where large estates have been cut up and the blocks selected were at one time under cultivation. As a result of a questionnaire addressed to land owners, it was found that the majority were emphatically of the opinion that windbreaks, etc., were vitally essential, especially for stock shelter, although in some districts standing timber and the shelter of hills already fulfilled this function.

The effects of erosion are evident in many parts, both on the hilly country and plains. Many watercourses have sanded up to a greater or lesser extent, and on undulating country deep gutters have been washed on sandy wheat land. Such erosion is frequently due to farming operations, over-stocking, or rabbit depredations, but the wide destruction of tree life is also responsible.

Although the major portion of the division still enjoys a fairly abundant timber supply, in many of the more closely settled districts and in the neighbourhood of large towns, there is a definite shortage of timber for fencing and building purposes, while in other areas such supply is getting low, and a future shortage is inevitable. Long haulage is frequently necessary, even for fuel, and in some centres iron posts are being employed in place of timber.

Fodder trees, particularly the Kurrajong, are of value in tiding stock over drought periods, their usefulness in this respect being generally recognised by pastoralists.

From the point of view of tree requirements, the most essential needs are for shade and shelter trees, windbreaks and fodder trees. In some districts the advantages of tree-lots are fairly evident, and conditions in most parts are sufficiently favourable to permit their establishment, artificially or naturally, with a reasonable prospect of success. Conditions for tree planting and development are fairly satisfactory in the majority of districts, provided hardy or moderately hardy species are selected, although on the lower slopes adjoining the Western Plains Division, rather severe conditions prevail, the choice of species being considerably restricted. For successful growth, however, thorough preparation of the ground, combined with a certain amount of after-cultivation and attention, is essential.

Native Tree Flora of Western Slopes Division.

In some respects the tree flora of this division has points in common with that of the Western Plains on the one hand, and the Tablelands on the other, although containing certain species, such as the White Box (*Eucalyptus albens*) which are peculiar to, or reach their best development in, the Slopes Division.

A number of typical Plain species invade the western portion of the division to a greater or lesser extent, and in some cases occur scattered throughout the entire division. A few of the Tableland species descend a little on to the upper portions of the Slopes in the east, or are found on elevated portions, such as the Nandewar and part of the Liverpool Ranges.

Although individually the tree species of the division are, in the main, common to other divisions as well, collectively the tree flora is fairly distinctive and characteristic.

Among the Western Plains species to be found in this division, particularly on the western portion, are the Wilga (*Geijera parviflora*), Budda (*Eremophila Mitchelli*), Quandong (*Fusanus acuminatus*), Wild Orange (*Capparis Mitchelli*), Berrigan (*Pittosporum phyllyraeoides*), Belah (*Casuarina lepidophloia*), Wild Lemon (*Canthium oleifolium*), Needlewood (*Hakea leucoptera*), Quinine (*Alstonia constricta*), Whitewood (*Atalaya hemiglauca*), Dogwood (*Myoporum deserti*) and Emu Bush (*Eremophila longifolia*). The Bull Oak (*Casuarina Luehmanni*) Rosewood (*Heterodendron oleaefolium*) and the Warrior Bush or Currant Bush (*Apophyllum anomalum*) are fairly widely distributed in many parts of the division. All the above species have been fully described in a previous section of this article, which dealt with the Western Plains Division.

Yellow Box (*Eucalyptus melliodora*).

Eucalypts.

The majority of the more important tree species of the Slopes, however, are Eucalypts or Cypress Pines.

BOXES.

YELLOW BOX OR YELLOW JACKET (*Eucalyptus melliodora*).

A medium to large-sized tree, of drooping habit and ornamental appearance, although sometimes considerably gnarled and twisted.

It is widely distributed throughout the division, but reaches its best development in cooler districts with fair rainfall. It is found on most soils, except very poor sandy types, but prefers rather heavy alluvials. It appears to avoid the black soil plains, and is generally regarded as an indication of good soils. As it goes west it gradually leaves the hills, taking to the river flats in order to make its most westerly development. The bark when peeled off shows a yellow inner surface, giving rise to the vernacular name of this species.

Uses:—It is a highly ornamental tree, and one of the finest shade and shelter trees for this division. Being a fairly rapid grower it is worthy of extensive planting where such trees are needed. A useful honey tree. The

timber is pale coloured, hardy, heavy and durable, but with an interlocked grain which makes it difficult to split, and is therefore often left alone in favour of other timbers. It is generally regarded as very durable in the ground.

White Box (*Eucalyptus albens*).

A medium to large-sized tree of spreading habit, and with pale, somewhat silvery leaves.

It is widely distributed throughout the division, especially in the eastern portion, being often associated with pine on the principal wheat belts, and is typical of and mainly confined to the Western Slopes and Upper Hunter valley. It prefers fairly rich, well drained soils, occurring on basalt, granite and alluvials. When growing on sedimentary soils it appears to avoid rocky situations. In some districts it is also known as Grey Box.

Uses.—It is a fine ornamental, shade and shelter tree, and is frequently left standing for these purposes when clearing operations are being carried out. It has some value as a fodder for drought periods, being probably the best of the Eucalypts in this respect, although much less useful than other western trees. Usually only the older trees are lopped and the leaves are allowed to dry for a day or two. It appears to be astringent, stock requiring a change after two or three days. A useful bee tree, providing the main source of honey during autumn months. The timber is durable and of fairly good quality, in addition to making an excellent fuel. Some trees, however, have a tendency to become hollow.

Red Box (*Eucalyptus polyanthemos*).

A medium-sized tree, with fairly heavy, somewhat glaucous, foliage, generally found on sedimentary formations on the foothills and lower mountain slopes of the central and southern subdivisions. It is sometimes associated with the White Box (*Eucalyptus albens*), but is not so abundant as that species. On shallow soils it is small and gnarled, but reaches 60 feet on deeper soils.

Uses.—The timber is reddish, strong, and said to be very durable in the ground. The tree is fairly ornamental and useful for shelter purposes, but is not so useful as the White Box or Yellow Box.

Narrow Leaf Box (*Eucalyptus pilligaensis*).

This species occurs on the warm dry country of the Western and Central-western Slopes, usually below an elevation of 1,000 feet, and is described under the Western Plains Division.

Fuzzy Box (*Eucalyptus conica*).

This species is also commonly known as Apple Box on the Lachlan, and is sometimes referred to as White Box or Blue Box in some districts. It is a medium-sized tree, usually with a good straight stem and attractive pendulous branches, the fuzzy or woolly bark distinguishing it from some of the other Boxes.

It is scattered throughout the division, but mainly in the central subdivision, and to some extent in the northern subdivision. In the Lachlan, where it is most plentiful, it generally occurs below 1,100 feet elevation, but ascends the slopes as it goes north, reaching 2,700 feet at Tingha. It is generally found on heavy alluvial soils or sandy loams on low land along stream courses, being rare on hills, although also occurring on poor granite soils.

Red Gum (*Eucalyptus Blaylyi*).

Uses.—The timber is brown or red in colour, hard and durable, but is rather difficult to split, and is not used extensively. It does not burn so readily as many other western trees. Useful for shade and shelter.

A Box (*Eucalyptus microcarpa*).

This species is known variously as Black Box, Grey Box, or Green White Box, but no generally accepted name is applied to it.

A medium to large-sized tree found chiefly in the central and southern subdivisions in the lower and warmer zones. It occurs on clayey soils, heavy alluvials or limestone formations, mainly on flat or gently-sloping country.

Uses.—The timber is pale-coloured or light-brown, strong and durable, and makes fairly good fencing posts, etc.

Bimble Box (*Eucalyptus populifolius*).

This species comes in from the Western Plains Division on the lower parts of the North-western Slopes, and is described under the Plains Division.

GUMS.

A Red Gum (*Eucalyptus dealbata*).

A tree widely distributed both in the cooler and hotter portions of the division. It is an umbrageous, medium-sized tree, rather silvery in appearance, with drooping, willow-like habit, although sometimes reduced to a

crooked, stunted, or mallee-like growth where conditions are not suitable. The bark is smooth, but there is always a certain amount of rough bark at the base which extends for varying lengths up the trunk. It is found on a variety of soils, but is essentially a tree of dry sites, favouring sedimentary soils on the tops or sides of hills and rocky ridges.

Uses.—A useful shade and shelter tree. The timber is only of moderate usefulness, and, owing to the crooked habit of growth of the tree, is difficult to obtain in good lengths. It is said, however, to be fairly durable.

A Red Gum (*Eucalyptus Blakelyi*).

A variable tree, being sometimes small and straggly, but reaching good development on better, deeper soils. It is probably the most common "Red Gum" of the division, occurring both on alluvial flats and on well-drained hillsides, and is associated with some of the Boxes in the foothill country, particularly between the 1,000 and 2,000 feet elevations. The branches are drooping, and the bark smooth and more or less blotched. Known sometimes as Cabbage Gum.

Uses.—The timber is reddish and of moderate quality, being used not uncommonly for fencing posts. Well-grown trees provide good shelter.

River Red Gum (*Eucalyptus rostrata*).

This species is found along the banks of rivers and creeks in the western portions of the division, but does not ascend the slopes to any extent, its place being taken in the upper portions by the River Oak (*Casuarina Cunninghamiana*). It is also found, however, in the Upper Hunter valley. (See Western Plains Division for further description of this species.) Although invariably found near watercourses in this State, it has been successfully grown on dry sites in South Africa, and is recommended for planting for shelter, breaks and timber in the Slopes Division.

Bancroft's Gum (*Eucalyptus Bancrofti*).

A small to medium-sized, rather straggly tree of generally poor shape, found in the northern subdivision, but extending to the Tablelands and Coastal Divisions. It is confined to poor, sandy soils, the timber being only suited for fuel and rough purposes.

IRONBARKS.

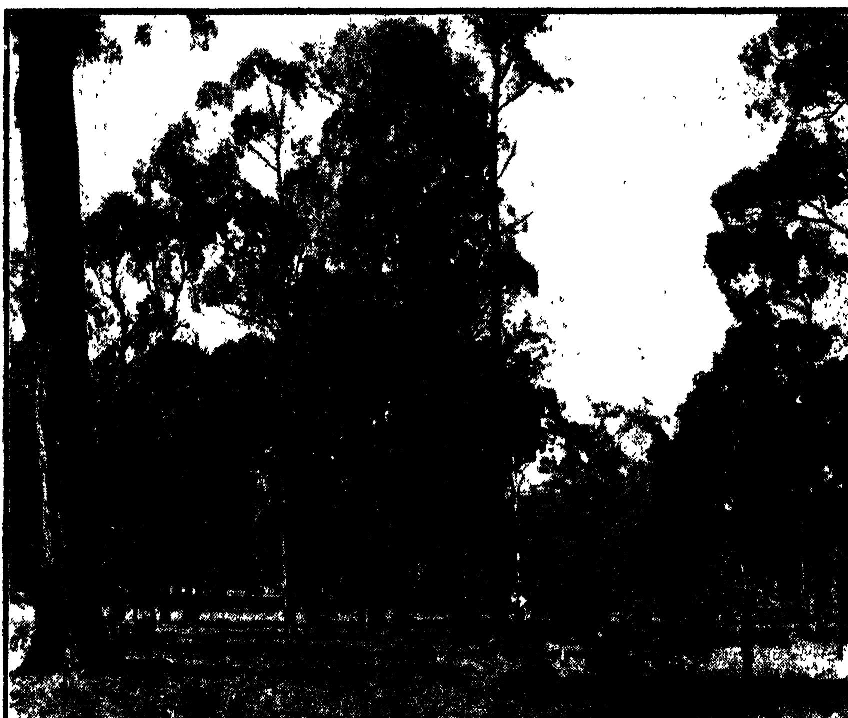
Narrow-leaf Ironbark (*Eucalyptus crebra*).

A medium to large tree of spreading habit, with rough, corrugated, hard bark. It forms important forests mixed with Cypress Pines in the northern and central subdivisions, reaching its best development on deep, fairly good soils or sandy soils with a clay subsoil. It apparently prefers a summer rainfall and extends to the Coastal Division. It is most commonly known as "Ironbark" in the districts in which it grows, but is also called "Red Ironbark" and occasionally "Grey Ironbark."

Uses.—The timber is very hard, strong and durable, and is largely in demand for sleepers, bridge work, fence posts, &c., for which purposes the areas on which it grows most commonly are being exploited. A slow-growing species after reaching the pole stage.

MUGGA OR RED IRONBARK (*Eucalyptus sideroxylon*).

Not so abundant as *Eucalyptus crebra* in the northern subdivision, and is usually found on poor soils on ridges in distinction to the former species. Coming south, however, it appears to replace the Narrow-leaf Ironbark. It is scattered over the whole of the division, from the far west to the Upper Hunter valley. (See Plains Division for fuller description.)



Sapling Growth of Ironbark (*Eucalyptus crebra*).

SILVER LEAF IRONBARK (*Eucalyptus melanophloia*).

Fairly widely distributed in the northern and central subdivisions, extending across the Tablelands to the Upper Clarence, &c. (See Plains Division for full description of this species.)

BLUE LEAF IRONBARK (*Eucalyptus siderophloia* var. *glauca*).

A small tree occurring usually on sandy soils, on stony ridges, or on pans subject to waterlogging, and is not uncommon to the north-east of Dubbo.

It is found both in the central and northern subdivisions, but the timber is regarded as much inferior to that of other ironbarks.

CALEY'S IRONBARK (*Eucalyptus Caleyi*).

A fairly rare species occurring on the slopes of the New England tablelands, and not descending below 1,500 feet. It is sometimes known as Mountain Ironbark, and is used locally for fencing posts, &c.

STRINGYBARKS.

RED STRINGYBARK (*Eucalyptus macrorrhyncha*).

A small to medium-sized tree, usually with a good straight bole, occurring on the higher portions of the division which enjoy a fairly good rainfall. The western limit of this species coincides roughly with the eastern boundary of the White Box (*Eucalyptus albens*). It is found in all three subdivisions, and does not appear to have any decided preference for certain soils, although most abundant on those of sedimentary origin or clayey soils over shale.

Uses.—The timber is of a reddish colour, fissile and easy to work, and is regarded as one of the most useful timbers for general purposes. It is durable and freely used for fencing. The bark is used for roofing huts and outhouses. A useful shade and shelter tree.

WHITE STRINGYBARK (*Eucalyptus eugeniodes*).

This species, or a form of it, comes down a little from the Tablelands into the northern subdivision, but is not typical of the division.

Miscellaneous Eucalypts.

APPLE (*Eucalyptus Stuartiana*).

A medium to large-sized tree with spreading crown and pendulous branches, the bark soft, whitish, Box-like and rough to the ends of the branches. It is fairly widely distributed in the division, mainly in the eastern portion, extending on to the Tablelands Division. It is found chiefly on alluvial soils on flats and along watercourses, but sometimes grows on slopes and hillsides. It is almost always known as Apple, but occasionally is called Woollybutt or Pepperment, especially in those districts where the other tree known as Apple (*Angophora intermedia*) occurs. The term Apple is applied to a number of species, and illustrates how unsatisfactory it is to refer to a species by the vernacular name only.

Uses.—The spreading crown and fairly dense foliage of this species provides good shade and shelter, and it is fairly hardy in most parts of the division. The timber is pale brownish in colour and is generally regarded as being of very little value, although the evidence is contradictory on this point.

APPLE OR MOUNTAIN APPLE (*Eucalyptus elaeophora*).

This species resembles in general appearance the better-known Apple (*Eucalyptus Stuartiana*), but prefers well-drained sites and is not found on the damp flats, &c., inhabited by the latter species. It is also known

as Bundy or Bastard Box, and is usually a small, rather crooked tree, with somewhat pendulous branches, often associated with Red Stringybark (*Eucalyptus macrorrhyncha*) on poor, sedimentary soils on slopes in the central and southern subdivisions. It is, however, also found on basaltic soils, but never on alluvial flats. It is a species of the Tableland Division, and in many districts does not descend below 2,000 feet, although found at Albury and other districts of low altitude.

Uses.—It has a limited use as a shelter tree, and provides some fuel, but is not included among the useful species of this division.

IRONBARK BOX (*Eucalyptus affinis*).

This species resembles an Ironbark on the lower part of the tree, but the upper portion is Box-like. It is possibly a hybrid between the White Box (*Eucalyptus albens*) and Mugga (*Eucalyptus sideroxylon*). It is also known as White Ironbark or Black Box, and is found on ridges in the Dubbo, Wellington, Parkes, and Grenfell districts, having a decided preference for sedimentary formations.

Bloodwood (*Eucalyptus trachyphloia*) is found on parts of the central and northern subdivisions. (See Plains Division for full description.)

A number of the Mallees occur in the western parts of the central and southern subdivisions, and include Red Mallee (*Eucalyptus oleosa*), a shrub or small tree with reddish-brown durable timber, Broad-leaf Mallee (*Eucalyptus Behriana*), a species with large, thick, shiny leaves, found only at Wyalong and Barmedman, and Green Mallee (*Eucalyptus acacioides*).

(*To be continued.*)

GRAIN RESEARCH IN CANADA.

THE Canadian Government has decided to devote the entire amount of money resulting from "overages" in Canadian terminal elevators toward research in connection with grain problems. In making this announcement recently, the Minister of Trade and Commerce, stated that the decision had been made in view of the ever increasing number of problems respecting the production and marketing of Canadian grain.

The expenditure of moneys resulting from "overages" will be under the direction of the National Research Council; and the order-in-council relating to the disposal of such moneys along these lines has been passed. Expenditures will be utilised not only to subsidise and extend the various researches now under way in universities and research laboratories at present conducting such work, but will make possible research on many pressing problems for which money heretofore has not been available.

In the opinion of the Government, moneys accruing from the grain trade should, as far as possible, go toward the solving of the problems of that trade. Among the most important problems in connection with which research has been going on for some time past is that of combating rust.

The amount of money from "overages" in Canadian terminal elevators at the disposal of the Government for the purposes mentioned is $219,000.

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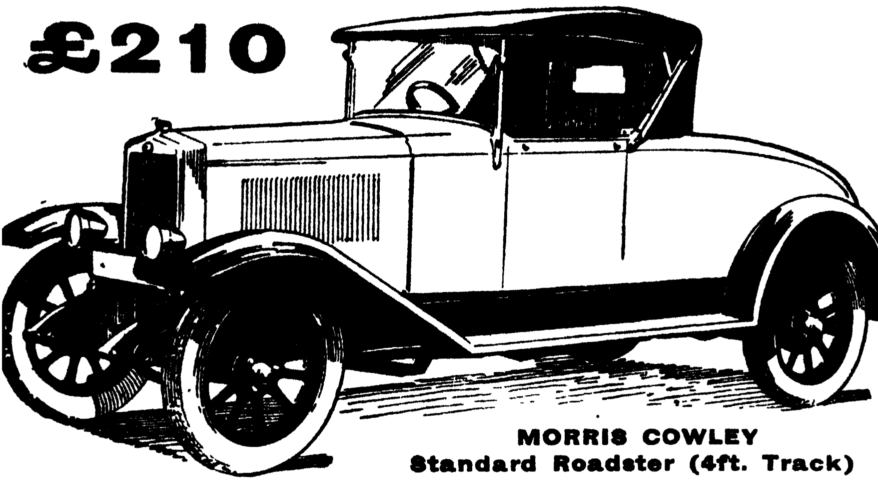

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New South Wales Butter Quality.

A. M. BROWN, Special Dairy Instructor and Senior Grader.*

As the spring of the 1927-28 butter season advanced, weather conditions gave promise of a particularly bright summer outlook for dairying, from a productive point of view at least. These indications proved correct, for despite the slightly retarding effect on production caused by floods which occurred in most of the North Coast districts in February, and by the dry spell experienced on the far South Coast, the total production figures, when completed, should indicate that the amount of butter manufactured throughout New South Wales from 1st July, 1927, to 30th June, 1928, has been one of the greatest recorded for the State. New record weekly figures relating to output have been established at a number of factories.

From a producer's point of view this is eminently satisfactory and is rendered more so by the fact that, although factory staffs and plants have been taxed to the uttermost in order to cope with the abnormal supplies of cream, the general quality of the manufactured article made from the cream has, generally speaking, continued to show improvement, and the percentage of "Choicest" butter packed at the factories during the past season has been greater than ever before. These factors indicate that something important has been accomplished towards enabling the majority of dairy-farmers to secure a reasonable return for their labours.

Although the quality of the butter produced throughout the State has mostly shown improvement, at times faults have been noted. At your Conference of last year, a paper was presented in which much of the subject matter contained therein dealt mainly with three particular faults which had been in evidence during the previous butter season. These were:—

1. A disagreeable aroma.
2. Condensed milk flavour.
3. Irregularity in flavour of butter made in different churns out of the same vat of cream.

During the season just past, these same faults have again been manifest. It is the principal object of the paper now before you to draw attention again to these defects, with the idea of emphasising them as problems, the solving of which requires serious consideration and special effort on the part of factory managers.

The members of the staffs attached to the Dairy and Biological branches of the Department of Agriculture have long since realised the necessity for effective remedial measures in regard to the occurrence of these faults in our butter, and they have carried out considerable investigational work connected therewith, the result of which has enabled the former to deal successfully with many cases where the defects mentioned have been noted.

* Paper read at Conference of Dairy Factory Managers and Secretaries, Sydney, 1928.

Disagreeable Aroma.

The principal features associated with this disagreeable aroma, which at times makes its appearance in butter, are:—

1. Its spasmodic occurrence.—This trouble has frequently been noted in butters at different times from widely separated districts. It has occurred in one day's manufacture and then disappeared after that date, only to recur on some later occasion to a greater or lesser degree.
2. Its presence in butter made in some churns and not in others although produced from the same vat of cream.—Frequently a certain number of churnings from a vat of cream have been affected, while others have shown no trace of the fault.
3. Its frequent disassociation from any very pronounced "off" flavour.—The flavour associated with this peculiar aroma varies according to the intensity of the latter. Usually, butter only slightly affected tastes very flat, with sometimes a slight cooked flavour. When the aroma becomes more pronounced a flavour which might be somewhat likened to that of burnt bone is present. However, although these off flavours occur in conjunction with this odour, they are not as objectionable as the repugnant nature of the aroma suggests.
4. Its rapid development.—Butter only four days old on its arrival in Sydney has often been known to be affected, and the trouble appears to develop afterwards with extreme rapidity.
5. Its presence in comparatively high acid butter as well as in butter having a less pronounced acid flavour.—What would be known in New South Wales both as high acid and low acid butters have frequently been affected alike. Factories where special care has been taken in the different items of procedure connected with the neutralising process, and also where this important work has not received the same attention, have each been known to produce butter having this objectionable aroma.
6. Its non-appearance in pasteurised or unpasteurised cream, or unpasteurised butter.—Officers of the field staff attached to the Dairy Branch are continually grading cream throughout the year at different factories in the State, and many of them have also had long experience outside the Department in this work, besides discussing cream flavours at numbers of Dairy Science Schools held each year, but there is no record of these officers ever having noted this particular aroma in either pasteurised or unpasteurised cream. Butter graders with years of experience in grading both pasteurised and unpasteurised butter have never noted this trouble in connection with the unpasteurised article.
7. Its development at low temperatures.—Many instances have occurred where this disagreeable aroma of decomposition has developed after butter has been placed in cold store, and all the evidence to hand indicates that low temperatures do not prevent its further development in butter already affected.

The information supplied by the observations connected with features Nos. 1, 2 and 4, appear to supply definite indications that bacterial action is, to some extent, responsible for the occurrence of this offensive odour, while the latter's association with cooked flavour and its appearance in pasteurised butter only, as recorded in conjunction with features Nos. 3 and 6, indicate the probability of some circumstances or condition brought about by pasteurisation being also associated with this phenomenon. The fact that so called high acid and low acid butters may be affected alike, as discussed under sub-heading of feature No. 5, signifies to some extent that the presence of acid has no controlling influence over this aroma.

Quite a number of instances have come within the purview of officers of the Dairy and Biological branches of the Department of Agriculture while investigating this problem, where contamination from insanitary churns, workers, and other wooden utensils, and the consequent bacterial action brought about by this condition, have been definitely proved to be at least partly responsible for causing this aroma. It has not, however, been satisfactorily demonstrated whether any type or types of living organisms set up the action which causes this trouble in the affected butter, or whether the by-products produced by these forms of germ life are responsible, although some evidence has recently been forthcoming which somewhat supports the former statement, while a significant conclusion concerning the latter theory arrived at by an officer of the Biological Branch in connection with investigations concerning this aroma is contained in an official report on the matter, the text of which is as follows:—

The conclusions arrived at are, that there seems at least a possibility that the odour of decomposition in butter is associated with the decomposition of nitrogenous material such as casein (curd) or albumen, but it is not thought that this decomposition commences in the manufactured butter, on account of the fact that, after examining many samples of tainted butter, putrefying bacteria have not been constantly found in numbers large enough to cause trouble.

It is likely, therefore, that the putrescent curdy material which exudes from the glands of the cream storage vats, and the decomposed butter-milk from crevices in churns, workers, and other fat-saturated appliances become incorporated in the butter during manufacture, and there, in the form of minute particles, continue to alter apparently through the action of enzymes and bacterial by-products producing the volatile aroma of decomposition characteristic of such affected butter.

However, whether this fault is due solely to the action of living bacteria on any of the constituents of butter, to the butter coming in contact with the by-products of these organisms in or on the insanitary wooden appliances, or to any other cause, the fact remains that when churns, workers, barrows, and other wooden utensils receive disinfecting treatment and a thorough cleansing, and in some cases where new items of similar equipment are substituted for these already fat-saturated insanitary articles, which have become impossible to clean satisfactorily, the trouble disappears.

Condensed Milk Flavour.

There are three kinds or degrees of what is known as "cooked flavour" in butter. The first one is similar to that of newly pasteurised cream or

milk after it leaves the cooler. This is rather a pleasant type of butter flavour, and usually disappears soon after manufacture. It is not penalised by the graders. Then we have what is termed a "scorched flavour," which is very like that of milk after part of it has been burnt on the sides of the vessel or pasteuriser in which it is heated. It does not develop as time goes on, although it is undesirable, and is penalised accordingly by the graders.

We now come to the third type, termed "condensed milk flavour," which is most objectionable in butter. This form always becomes more pronounced after a time, either in or out of cold store. It is no doubt primarily due to the cooking or over-heating of the curdy matter in cream, combined with the caramelising of the milk sugar content, which conditions are principally brought about by irregular feeding of the pasteuriser, interruptions in the heating, or slow heating of the cream. When it is considered, however, that definite proof has been forthcoming that the flavour under review develops in accordance with the age of the affected article, that in butter made out of a vat of cream some churnings are affected while others are not, and that after a thorough cleansing of the churns and other wooden equipment the trouble disappears altogether, it can reasonably be concluded with some degree of certainty that bacterial action also plays an important part in causing condensed milk flavour in butter.

Irregularity in Flavour of Butter from same Vat of Cream.

Incorrect churn markings placed on boxes at the factories are not by any means the only reason for very considerable variations in the grading points appearing on grade slips sent to the factories in connection with butter made in different churns out of the same vat of cream. That these irregularities actually do exist is beyond question. It has been repeatedly found that different churns in some factories are in a better sanitary condition than others, due to a number of factors; and it has been proved beyond doubt that they are subject to different degrees of bacterial contamination on this account. Additional instances to those of last season have also come under the notice of Departmental officers where this irregularity in flavour has existed, and when the churns and other wooden equipment, which appeared to be insanitary, received a thorough cleansing and scalding the trouble disappeared.

When these facts are considered there appears to be little doubt that the varying sanitary condition of the churns and the consequent different degrees of bacterial contamination present in them are mostly responsible for the irregularity in flavour indicated.

Importance of Cleanliness and its Relation to Quality.

Most of the evidence assembled in connection with the three faults already enumerated points to the conclusion that they are primarily or solely due to contamination after pasteurisation, mainly from churns,

workers, barrows, and other wooden equipment. Therefore, too much stress cannot be placed on the importance of keeping these items in a clean and sanitary condition.

All will agree that there is no part of the factory equipment which is so easily subjected to bacterial contamination as the abovementioned apparatus, for the following reasons:—

1. Being made of wood, they become more or less porous according to the amount of care they receive and to their length of service.
2. During a busy season, especially, there are parts of them which are always wet.

These two conditions alone are particularly favourable to the growth of bacteria. If the cleansing has not been regularly and thoroughly done the organic matter left behind in the pores, joints, or crevices in the timber, also provides suitable food for the growth of these forms of germ life.

The question of cleanliness in butter factories has been discussed frequently, and while, no doubt, the great importance of this matter in relation to quality is now being realised to a greater extent than previously, unfortunately, ideas, or shall we say standards of cleanliness, differ in individuals. Therefore, the employee who is responsible for the work of cleansing in a butter factory should be specially selected. He should be a man who thoroughly realises the great importance of this work, and his conception, or standard, of cleanliness should be of the highest. Attention to detail and proper methods are just as essential in his job as in that of any other employee. A man possessing those qualifications should be on every factory staff—his services would be invaluable.

Other Faults in Flavour due to some Uncommon Cause.

A few other faults in the flavour of butter have come under the notice of the field staff of the Dairy Branch during the past season, which presented interesting features from the fact that they were brought about in rather unusual ways.

Metallic Flavour.—A distinct metallic flavour was noted by the grader in the flavour of butter from a particular factory. The Senior Dairy Instructor in charge of the district in which this factory is situated, on investigating the occurrence, came across a leak in the brine section of the pipe cooler. The moisture around this leak tasted very metallic, as would be the case with brine which was in circulation through metal pipes and stored in metal tanks. This leaking section was disconnected during necessary repairs and the cooling done over the other section. The metallic flavour at once disappeared.

Ammonia Flavour in Butter.—In another instance it was found that, owing to ammonia from a leak in a pipe in the brine tank having become mixed with the brine, and a leak having also occurred in the cell of a "Batch" vat used for the storage of cream, part of the ammonia-tainted brine had in turn passed into the cream, and the flavour was, in this manner, transferred to the resultant butter.

"*Unclean*" *Flavour*.—A manager, in an endeavour to locate a source of infection which was suspected of causing inferior quality butter at his factory, found that the fins or the strips of metal soldered on to the lower sides of the lengths of piping comprising the cooler had broken away in many places and allowed cream (which cleaning had failed to remove) to lodge in the cracks thus made. The necessary action was taken to remove this contaminating influence with satisfactory results.

Texture.

The texture of our butter during last season continued to be decidedly good on the whole. There is no feature connected with the butter of New South Wales which has been subject to a greater improvement during the past few years than texture.

It is now evident that throughout this State considerable progress is being made towards standardising this important item of manufacture. More attention is now being paid to the control and successful incorporation of moisture, and it is rather unusual to come across samples showing any great amount of free moisture. Some cases of irregularity in this direction are, however, still in evidence, showing that either the outfits available for checking the water content at the factories are not being used correctly or not at all, or that when tests are made for moisture content the variations in the manufacturing process are not made in accordance with what is revealed as necessary by the results of these tests.

Salting.

Special mention was made last year of irregular and insufficient salting, and these faults are still present in many butters. Butter made from pasteurised cream tends to be flat in flavour, and sufficient salt needs to be added to counteract this, what might be termed, lack of character.

Generally speaking, with but few exceptions an all-round slight increase in the salt content of our butters is recommended, but that this should not be overdone is specially stressed.

Packing.

While the packing and general get up of New South Wales butter have been very satisfactory, it is desired in conclusion to draw attention to a number of instances where the top surface of some samples has had a definite stale aroma and flavour. This has probably been caused by using old furry-surfaced and fat-saturated rammers, scrapers, or rollers for finishing off the tops of the butter concerned. Being of small size, the cleaning of these utensils is very apt to be overlooked, especially during a busy season, although it is just as necessary to have them in as sanitary a condition as any other part of the factory equipment. When these implements become old and fat-saturated with a woolly surface, it becomes impossible to thoroughly clean them and they should be discarded altogether.

Experiments in the Control of Black Spot of the Vine.

H. L. MANUEL, Viticultural Expert.

UNLIKE most of the vine diseases with which we are familiar, anthracnose is not a native of America, but is indigenous to Europe, where it has been known for many centuries. The disease is due to the fungus *Gloeosporium ampelophagum.* According to Hesler and Whetzel, American plant pathologists, only one spore stage is known, but in France scientists claim to have discovered a winter sexual spore stage, with the result that the name of the fungus has since been changed to *Manginia ampelinum.* The mycelium or fungus threads grow within the affected tissue of the vine, some of the threads coming near to the surface and forming fruiting bodies in the anthracnose wounds.

These fruiting bodies burst through the skin sending out *conidiophores* on which *conidia* are produced. These spores ooze out in a gelatinous mass held together by their sticky coverings. The sticky substance is soluble in water, and consequently dew or rain is necessary to bring about a liberation of the spores. The spores, when liberated, fall upon the green parts of the vine where they germinate, sending out filaments which enter the tissues and spread, causing depressions and scars on the canes and berries, the effect on the leaves being to cause shot hole.

Like downy mildew the disease is internal, and preventive measures are necessary. When the fungus is growing actively copper solutions as sprays are of some value, but to attack it in the resting or winter stage a stronger and more penetrating solution is necessary to reach and kill the dormant mycelium, hence the use of sulphuric acid solutions.

Black spot differs from downy mildew and oidium in that it can develop at a much lower temperature. The *conidia* may germinate early in the season, attacking the growth of the vines in the young stages. The spread of the disease is not rapid at this period, but with warmer weather it increases more rapidly. As with downy mildew free moisture is required for its development, and muggy weather favours the spread of the disease.

Although the spread of anthracnose is not as rapid as downy mildew, given suitable weather conditions, it can do an enormous amount of damage. Its first appearance on the shoots in early spring is in the form of livid spots which become somewhat depressed towards the centres as they spread. The spots increase in size, darkening in colour, and the more humid the conditions the more rapidly they grow, spreading in patches on the internodes, and thus forming scars. The highly coloured portions in the centres of the scars are the spores.

How the Vines are Affected.

When the vines are badly affected they become stunted, and the canes are liable to snap off in windy weather at the shankers, as the scars are termed.

The vine has a sickly appearance and shoots are inclined to droop. The leaves become deformed, and the stalks of the leaves are affected in the same way as the shoots. On the leaves themselves one sees, at first, small reddish-coloured spots, which, as they increase, assume a dead coloured centre with dark outer edges. The centres of the spots fall out, giving the appearance of shot holes. It is possible for the bunches to be attacked before the flowers have opened, causing scorching and retarding the formation of the berries. If the flowers are attacked the disease will prevent the setting of the fruit, and when the young bunch stalk is attacked the disease is capable of doing such damage as will prevent the berries from developing, and it may cause a whole bunch to dry up, thus forming "mummies."

On the berries the lesions appear as small dark areas, the colour later turning greyish in the centre, the border remaining dark. These spots increase in size, being circular and not elongated as on the canes, and in between the grey centre and the black border a reddish band is apparent, which gives the spots the appearance of an "eye," giving rise to the term "bird's eye," as applied to the berry spots. The effect on the berry is that it fails to develop properly and becomes irregular in shape, making grapes unsightly and unsaleable for table purposes. Moreover, grapes badly affected with black spot, like those attacked by downy mildew, make poor quality wine.

Low-lying areas and badly-drained localities are very susceptible to the disease, and moist climates are very favourable to its development. Sandy soils, as a rule, are more prone to trouble than soils of a stiff nature, owing to such soils being damper on the surface. The drier the surface of the soil the less risk of black spot. Irrigation areas are always liable to an outbreak. We know that heavy weed growth in a vineyard has a tendency to develop conditions which are somewhat favourable to the disease. Any work that has a tendency to keep the air moist in proximity to the vine is favourable to its development. Although it is realised that it is not practicable in all instances to delay cultural operations in the spring, it should certainly be worth while studying the spring weather conditions in order to avoid working the soil as much as possible at times when weather conditions appear favourable to the development of the fungus, more especially if the disease has been rampant the previous season. Vines grown on high trellises are less susceptible to trouble than those growing near the ground.

In the event of a grower being caught unawares and experiencing a severe attack very early in the season, resulting in the young shoots being badly injured, he may prune the young shoots as is done in the case of frost trouble, which is very beneficial in that it gives fresh growth for pruning wood—in the following season at all events.

Varieties Susceptible to Attack.

I expect one would be right in saying that the Sultana is the most susceptible of our widely-grown varieties in Australia to-day, and Doradillo, Malaga, Waltham Cross, Grenache, Muscats, Carignane, Crystal, Valensi, Currants, Riesling, &c., are all more or less liable to be attacked.

In America, I understand that the Labrusca types are susceptible, and I have seen it quoted that the following varieties are affected:—Catawba, Salem, Niagara, Brighton, Missouri, Clinton, Morris Diamond, &c. As far as my experience goes with Labrusca types, I do not recollect seeing them badly affected. It may be that I have not seen these types growing in low-lying localities, but I have seen them growing under similar conditions to Riparia x Cordifolia-Rupestris 106.8, which was badly affected.

Treatment.

It is perhaps unnecessary to mention that all cuttings or prunings from affected areas should be burnt, as that is the general method adopted at the present time for disposing of prunings. The risk of new vine districts becoming affected is minimised if vine cuttings from diseased areas are not introduced. The spread of the disease is not like that of downy mildew whe; countless millions of spores are carried long distances by the winds during the season.

The only satisfactory manner of combating black spot is to make the main attack during the winter or dormant period of the fungus, which is passed chiefly in the form of hibernating mycelium and sclerotial bodies. The aim of the winter treatment is to destroy all hibernating forms of the fungus, and this can only be done by using some drastic and powerful corrosive; some solution that will be of a sufficiently penetrating nature to destroy the dormant fungus without damaging the vines. To the best of my belief a sulphuric acid mixture used as a swab has become the most widely known remedy. Besides being effective for black spot it is also beneficial in eradicating erinose and vine scale. I have read American literature wherein is recommended lime-sulphur for winter treatment, and in travelling around my own State I occasionally hear that winter-strength Bordeaux is satisfactory, and so from time to time one reads or is told that such-and-such treatment is good. But in all such instances I have never been able to learn if comparisons have been made with sulphuric acid swabs. Moreover, it was pointed out in 1917 by Castella and Brittlebank, in Victoria, that Bordeaux mixture and lime-sulphur were useless when applied as winter swabs. And recent experiments carried out by the Viticultural Branch of the Agricultural Department, on Mr. Mill's property, Murrumbidgee Irrigation Areas, prove conclusively that the sulphate of iron-sulphuric acid swab is the best of known remedies.

Results of Swabbing Experiments.

The weather conditions during October, 1927, were very favourable to anthracnose development, and caused a rather severe outbreak of the disease in parts of the Murrumbidgee Irrigation Areas, and where departmental experiments were being conducted the disease was severe, thus enabling satisfactory comparisons of treatments to be made. The block selected for these experiments, which have been carried out every year since 1925, was one growing Sultanas. The land is a low-lying portion of the vineyard where irrigation water accumulates and where considerable damage has

been caused by black spot in previous years. The plots were even and similar in every respect as regards soil, location, &c., the rows being side by side.

Plot No. 28 was swabbed with sulphate of iron 100 lb., sulphuric acid 10 pints, and water 20 gallons.

Plot No. 29 was swabbed with sulphuric acid 15 pints, and water 20 gallons.

Plot No. 30 was treated with boiled lime-sulphur (lime 15 lb., sulphur 15 lb., and water 50 gallons).

Plot No. 31 was sprayed with winter-strength Bordeaux mixture (bluestone 15 lb., lime 10 lb., and water 50 gallons).

Plot No. 32 was sprayed with summer-strength Bordeaux mixture (bluestone 15 lb., lime 10 lb., and water 100 gallons).

Plot No. 33.—Check plot, no treatment.

Plots 28 and 29 were swabbed on 3rd September, when the buds were just swelling, but before any had opened. Nos. 30 and 31 were sprayed on the same date. Plot 32 was sprayed when the growth of the vines was about 9 inches long, and again two weeks later; while Plot 33 did not receive any treatment. The first noticeable effect of the swabs was to retard the bursting of the buds by from ten to fourteen days.

The effects of the different treatments on the black spot disease were as follows:—

	Vines affected. Per cent.	Bunches affected. Per cent.
Plot 28	8	Nil.
Plot 29	15	3
Plot 30	25	8
Plot 31	25	3
Plot 32	50	10
Plot 33	65	47

On the results of these experiments it is not possible to do otherwise than recommend the sulphate of iron-sulphuric acid swab treatment. What the actual effect of the sulphate of iron is I am unable to say definitely, but the fact remains that it gives the desired results, that being the main concern. It is quite possible that less sulphate of iron in the acid solution may give just as good results as the strength used in the above experiments, but I would like to have more definite information on the point before reducing the quantity. It would certainly be more convenient to use less sulphate of iron in the swabs.

If the disease has been bad during the previous season, two swabbings are desirable, as this ensures a more or less thorough clean up. The first swabbing should be given about three weeks before and the second immediately prior to the bursting of the buds. And although swabbing may be the main treatment it is advisable also to resort to spraying with Bordeaux mixture during the growing period. It is hardly necessary to mention the matter of spraying in New South Wales as most of the vine districts spray every year as a preventive measure for downy mildew.

Vines treated by swabbing, at first make young growth that is usually poor and somewhat irregular, but grow stronger later on, and as my assistant Mr. Lackie pointed out in his report on these experiments, the swabbed vines seem to be stimulated. In swabbing vines a thorough wetting is necessary, and the best time to apply the swabs is on a calm, cloudy day. Wind has a tendency to concentrate the solution, and it is advisable for the workmen to wear some covering, such as a chaff-bag, to prevent the acid from burning their clothes.

The mixing of the ingredients of swabs should be done in wooden or earthenware vessels. The sulphuric acid should be poured on to the sulphate of iron, at the same time mixing it well and then slowly adding the water to the mixture, stirring the whole while. Hot water should be used, the temperature best for mixing being about 170 degrees Fah. The swab mixture is applied by means of a brush—a tar brush or a swab made of string will be found effective. Avoid using any metal material (other than lead) in any operation during swabbing. Lead-lined pumps for spraying sulphuric acid are procurable, and can be obtained both in the knapsack and pressure barrel types. The operation is certainly carried out more expeditiously with pumps, but, personally, I do not consider them as efficient as the ordinary hand swabbing.

Before concluding, I might mention that I cannot recommend copper dusting powders in place of summer sprays, as the results, so far as I have been able to observe, have been far from satisfactory.

Kikuyu Grass in the Macleay River District.

In a letter received some time ago from Mr. H. Cooper, Jerseyville, Macleay River district, particular mention was made of the value of kikuyu grass in that locality. Mr. Cooper planted roots of kikuyu 6 to 8 feet apart among couch in September, 1927, and has since reported that the pasture was 90 per cent. kikuyu and 10 per cent. couch. Seed of White Dutch clover was scattered among the kikuyu, and this valuable legume has done wonderfully well. The cows prefer kikuyu to either couch or Rhodes grasses.

The country on which the kikuyu was planted is of a sandy nature.—J. N. Whittet, H.D.A., Agrostologist.

Insects Cause a Yearly Loss of £400,000,000 in U.S.A.

Losses exceeding $2,000,000,000 annually result from insect damage in the United States, nullifying the labour of 1,000,000 men by destroying from one-tenth to one-fifth of all crops, according to a statement by Mr. C. C. McDonnell, who is in charge of insecticide, fungicide, and caustic poison control in the Food, Drug, and Insecticide Administration of the Department of Agriculture, U.S.A.

Plant diseases are responsible for losses at least comparable to those attributed to insects, says Dr. McDonnell. Smuts alone cost 100,000,000 bushels of grain annually while the destruction due to rusts is even greater.

Plums and Prunes on Various Stocks.

Experiments at Yanco Experiment Farm.

W. W. COOKE, Fruit Instructor.*

FROM time to time progress reports have been furnished in connection with this experiment—some of which have appeared in the *Agricultural Gazette*—and it is still too soon to make a final report. However, the trees being now ten years old, it is possible to form more accurate opinions as to the most suitable stock for the different varieties of plums and prunes growing in this and similar ground.

The experiment was commenced in 1917, when a plot of not quite 5 acres was planted with the following stocks:—Myrobolan, Marianna, apricot and peach, in rows 24 feet apart, and in the order given above. When fit for budding, these trees were worked across with plums and prunes as follows:—Plums: Angelina Burdett, Grand Duke, Blue Imperatrice and President; prunes: Robe de Sergeant, Standard and Prune d'Agen.

The soil consists of from 6 to 9 inches of fairly heavy loam, overlying about 18 inches of stiff, red clay, under which a more friable yellow clay is found. All the trees received uniform treatment in cultivation, irrigation, etc., and as the land is uniform in quality and texture, any difference in growth, or in the quantity and quality of the fruit produced may fairly be attributed to the influence of the stock. The last row of Prune d'Agen has suffered somewhat from being next to a breakwind of Kurrajong trees, but as this row contains each variety of stock, no one stock has suffered more than another, though the average production of Prune d'Agen per tree has been slightly reduced in each case.

It was noticed, after a few years, that the growth made by a given variety of plum or prune was not of the same strength on all the stocks. Especially was this the case with plums, and as years went on it became evident that Marianna was not a suitable stock for either Angelina Burdett or President, the growth made by these varieties on Marianna being much weaker than on any other stock. It was also noticed that Prune d'Agen would not tolerate any shortage of moisture during the hot months of the year when growing on either apricot or peach stock. This aspect was more fully mentioned in an article in the *Agricultural Gazette* of November, 1926.

This season, with the view of making a more comprehensive report, the fruit from the Robe de Sergeant and d'Agen trees on each stock was harvested, dried, and graded separately. Table I gives the average number of pounds of dried fruit per tree for each stock, and also shows the percentage of various sized prunes—40–50s, 50–60s, &c.—in each of the averaged weights. It will be noticed that with Robe de Sergeant the greatest weight of dried prunes

*Formerly Orchardist, Yanco Experiment Farm.

was produced by trees on apricot stock, followed by Marianna, Myrobolan, and peach; also that the largest prunes (40–50s and 50–60s) were carried by trees on peach stock, Myrobolan, apricot, and Marianna following in the order given; and that Marianna produced the greatest weight of small prunes, although the crop was less than that on apricot stock by almost 5 lb. per tree. As Robe de Sergeant does not bud well on peach stock, the stock was first budded with Prune d'Agen, and a year later Robe de Sergeant buds were placed in the Prune d'Agen growth. Consequently all Robe de Sergeant trees are one year younger than those on the other stocks, and have an intermediate stock of Prune d'Agen. This should be remembered when comparing with the weight of fruit from trees on the other varieties of stock.

Table I shows that Prune d'Agen on peach stock carried the largest crop, followed by apricot, Marianna and Myrobolan; Prune d'Agen on apricot, however, produced the largest-sized prunes, and on Marianna the largest number of small fruit.

TABLE I.—Average Quantity of Dried Prunes per Tree, and the Percentage of Different Sized Prunes.

Variety of Prune.	Stock.	Dried Fruit per Tree.	Percentage of Prunes of Various Grades.					
			40–50	50–60	60–70	70–80	80–90	90–100
		lb.						
Robe de Sergeant ...	Myrobolan ...	22·69	23·4	15·3	27·9	12·4	21·0	Nil.
	Marianna ...	27·69	3 7	22·3	18·8	23·1	21·3	10 8
	Apricot ...	32·65	4·0	28·8	28·6	14·0	24·6	Nil.
	Peach ...	20·14	31·3	25·7	25·8	Nil.	17·2	Nil.
Prune d'Agen ...	Myrobolan ...	16·80	Nil.	5·5	33·0	29·5	32·0	Nil.
	Marianna ...	23·85	Nil.	Nil.	28·3	28·3	27·4	16·0
	Apricot ...	32·50	Nil.	Nil.	41·9	26·0	32·1	Nil.
	Peach ...	11·10	Nil.	Nil.	31·7	25·1	26·1	17·1

The fruit produced by the various plums was not weighed separately, so they could not be included in Table I, but all varieties on each stock carried heavy crops. Owing, however, to the increased size of the trees on apricot and peach stocks, these must have produced a far greater weight of fruit than those on Marianna and Myrobolan.

Mention has been made of the difference in size of the trees on the various stocks, and careful measurements were carried out this year to determine this difference. Table II gives the average height, spread and circumference of the trunk at 1 foot from the ground. It will be noticed that whilst apricot and peach produced the largest trees in almost every case, the difference in size was less noticeable with prunes than with plums.

Taking everything into consideration, it would appear that Marianna is not suitable stock for plums, and is a doubtful one for prunes in this class of soil and under irrigation; and that the trees on apricot and peach are larger in every case, and especially so with such plums as Angelina and President, those on Myrobolan being the next largest in size, with Marianna last.

As the trees are only ten years old, future years may somewhat modify the growth and cropping habits, so that it is yet too soon to give a final judgment.

TABLE II.—Average Height, Spread, and the Circumference of the Trunk 1 foot from the ground.

Variety.	Stock.	Average Height.		Average Spread.		Average Circumference.
		ft.	in.	ft.	in.	inches.
Angelina Burdett ...	Myrobolan ...	10	6	9	3	17
	Marianna	8	3	7	6	13½
	Apricot	13	9	11	3	20¼
	Peach	13	9	12	3	21
Blue Imperatrice... ...	Myrobolan ...	10	6	6	0	14
	Marianna	9	0	6	0	11½
	Apricot	13	0	8	6	18½
	Peach	13	0	9	0	17
Grand Duke	Myrobolan ...	9	6	6	0	11¾
	Marianna	7	9	3	9	8½
	Apricot	10	0	5	3	13½
	Peach	10	6	7	3	14½
President Plum	Myrobolan ...	9	9	8	9	14¾
	Marianna ...	8	9	7	6	12¼
	Apricot	11	6	9	0	17
	Peach	11	9	8	9	16½
Prune d'Agen	Myrobolan ...	10	0	9	0	19½
	Marianna	11	0	9	3	15½
	Apricot	12	6	9	3	17½
	Peach	14	9	10	6	17½
Robe de Sergeant ...	Myrobolan ...	10	9	9	6	14¼
	Marianna	11	3	10	6	17¼
	Apricot	12	6	10	6	19¾
	Peach	12	0	10	0	17
Standard Prune	Myrobolan ...	8	6	4	6	12½
	Marianna	7	0	5	0	11
	Apricot	9	0	6	0	13
	Peach	8	6	5	6	12

AUSTRALIAN BUTTER AND CHEESE EXPORTS, 1927–28.

ACCORDING to the annual report of the Dairy Produce Control Board for the year ended 30th June, 1928, there was a substantial increase in the production of butter and cheese as compared with the previous season. During the season 44,306 tons of butter and 3,298 tons of cheese were exported overseas, being an increase on last season of 10,302 tons of butter, and 1,530 tons of cheese. The destination of butter exported during the past season was—to the United Kingdom 38,138 tons, and to other countries 6,168 tons. Of the total quantity of cheese exported 3,083 tons were shipped to United Kingdom.

Orchard Cultivation.

H. BROADFOOT, Senior Fruit Instructor.

THERE are, as every orchardist knows, certain benefits to be derived from cultivation, but those benefits will not be fully realised unless the cultivation is thorough and is carried out intelligently and at the right time. Just as there is a right and a wrong way of cultivating, so also is there a right and a wrong time for carrying out the operation. There are more or less regularly recurring periods during which the soil rapidly loses its moisture, and it is vitally important at such times to conserve soil moisture so that the tree may not suffer during periods in which occur the greatest drain upon its energy—during bud-bursting stage or, for that matter, any time during the growing season.

The value of a soil mulch in conserving moisture during dry periods is generally recognised. As a rule the best time to cultivate the soil is whilst it is well supplied (not necessarily superabundantly supplied) with moisture. Every good shower should be followed by cultivation so as to prevent formation of a surface crust. The cultivation should, of course, not be too precipitate. Time should be allowed for absorption, but as soon as the surface is firm enough, and before moisture has had time enough to escape, the cultivator should be at work. In this matter sound judgment must be used, and there will be found plenty of scope for the exercise of discretion.

In addition to preventing loss of soil moisture by capillarity, cultivation, by controlling or destroying weed growth, prevents or reduces loss of soil moisture by transpiration, and it will assist in aerating the soil and in raising its temperature, thus inducing conditions favourable to tree growth. Nor are the foregoing the only benefits to be derived from thorough and judicious cultivation. The mechanical and physical conditions of the soil are improved, plant food is rendered more readily available, and many fruit pests are checked. As already suggested, sound judgment must be used, because over-cultivation will neutralise many of the foregoing advantages by causing rapid loss of humus. During autumn and winter months (say, from March to August) there is sufficient weed growth in many of our orchard districts to supply organic matter to the soil, but in other districts recourse must be made to the growing of green manure crops. Here again there is room for the exercise of judgment, for the cover crop may make such demands upon the limited supply of moisture in the soil that the fruit crop will suffer because of insufficient moisture.

Hillside Orchards.

In orchards situated on hillsides, as many of our orchards are, and especially if the slope is steep, there is always danger of loss of soil as a result of heavy rain. It is essential, therefore, to take such measures as will reduce this loss to a minimum. The danger of soil loss from steady rain may

be obviated, or minimised, by ploughing across the face of the hill, but there exists the danger of water collecting in one place, breaking over and eroding a channel down the hillside, carrying away surface soil. In times of much rain it is difficult indeed to arrange orchard drainage in such a manner as to carry off surplus water from the orchard itself, as an inch of rain gives a total weight of approximately 101 tons of water per acre.

The prevention of erosion will be much more difficult if drainage from hillside grassland or bushland enters the orchard. Water from such areas must be diverted from the orchard. It is sometimes advisable to make a wide, shallow drain, say, 4 or 5 inches deep in the centre, and 3 to 4 feet wide, with gradually-sloping sides. This drain should run to the lowest level, and may be allowed to become well grassed over. Deep

Early Winter Ploughing.

Puts the soil in a rough condition suitable for absorption of rains, and aerates the soil, thus aiding in the decomposition of vegetable matter ploughed under.

drains with perpendicular or steeply-sloping sides are very liable to erosion. Shallow furrows can be ploughed after any fine cultivation in spring or early summer. During the period of the year in which heavy rain occurs ploughing should be so arranged that each land carries the water which falls upon it. The distance that the furrows carry water must be shortened as much as possible.

Ploughing.

A deep ploughing after winter rains, and whilst the soil is in good condition, is necessary for the formation of a good soil mulch. Until it has had time to drain properly, and while it is still moist, the land should be allowed to rest. The deep ploughing should then be vigorously proceeded with. In warmer districts it should be completed by the end of July, in cooler districts by the end of August.

Early ploughing carries with it distinct advantages. Weeds are then soft and sappy and they are turned in when the soil is sufficiently moist to ensure rapid decay, and so hasten the breaking down of the organic matter to form humus. A soft, sappy weed, too, is much more easily and completely turned in than one which has reached greater maturity.

Judgment must be used in deciding upon the width of the cut. It should be so regulated that each sod rests lightly and evenly upon the other, and so that weeds and surface rubbish are turned under and completely buried. A good workman not only performs all the essentials of his work, but he also takes a pride in the general appearance of the finished job. In finishing off, therefore, he will neatly plough the headlands to a width of not less than 15 feet from the outside row of trees. Some hoe work will be unavoidable, but this can be reduced to a minimum by ploughing as close to the trees as possible, care being taken not to break branches, nor tear roots. The latter may be avoided by sufficiently raising the plough when near the tree.

What Implements to Use.

In maintaining a soil mulch the implements generally used are the tine harrow, the springtooth cultivator, and the disc cultivator. The tine harrow is an implement by which work can be done quickly and efficiently if the soil is moist and friable. On light and dry soils the springtooth cultivator, which stirs the soil without inverting it, is the best to use. It roughly separates the coarser from the finer particles of soil, bringing the former to the surface and leaving the latter underneath.

For keeping excessive weed growth in check the disc cultivator is excellent, but if used on very light, sandy soil it keeps the soil in a very fine condition, and its constant use is liable to affect adversely the mechanical condition of the soil. As a matter of fact, cultivation can be, and is, occasionally carried to excess. Too frequent cultivation prejudicially affects the mechanical condition of the soil by bringing about too fine a subdivision of the soil particles, so that the first soaking rain hardens the surface and necessitates another ploughing. All that is necessary is the maintenance of a good soil mulch during the summer and the destruction of weed growth. The cultivator or the harrow should not be used upon land that is wet.

It may not be out of place to point out that some growers after cultivating their orchards for many years have anything but a level surface. Frequently the soil is worked up towards the butts of the trees year after year, resulting in a well-defined trough midway between the rows of trees, which not only appear to grow, but actually do grow, upon mounds. Heavy rain runs off the mounds into the troughs, and a stream is formed which grows in volume and carries off valuable particles of soil and dissolved plant food. Tree roots are exposed and damaged, and sometimes destroyed during ploughing. It should, therefore, be one of the aims of the tiller of the soil to maintain a level surface.

Black Spot Infection and Cultivation.

Whilst conceding all the claims as to the advantages of keeping the soil well cultivated during the growing season, it is wise, at times, not to cultivate too early. One contingency which justifies departure from the general rule is the susceptibility of the locality in which the orchard is situated to black spot. In such localities postponement of cultural operations until a couple of weeks after fruit has set is fully justified. In some localities apple and pear trees are very susceptible to black spot during the period between bud-swelling stage and fruit setting. In these districts the use of the cultivator tends to bring to the surface numbers of leaves bearing black spot spores, which had been ploughed in during winter. When brought to the surface these diseased leaves infect the healthy trees, with subsequent injury to the fruit.

Summer Cultivation.
Note the clean cultivation and strong uniform growth of these six-year-old apple trees.

There is distinct relationship between rainfall and the occurrence of black spot. As a rule, the greater the rainfall during the period between bud-swelling and fruit-setting the greater the prevalence of black spot. At that period there is little likelihood of crops being prejudicially affected by loss of moisture owing to delayed cultivation, and if there is such a loss the grower will be more than compensated by the check given to black spot.

Lack of Moisture Causes Alternate Cropping.

Some fruitgrowers who complete their ploughing, and who cultivate efficiently during the first couple of months of the tree's growth, make the great mistake of not continuing with the cultivation well into the season. The drain upon the tree's vitality must be kept in mind and measures taken to keep the tree in the best possible condition to withstand that strain. The

tree has to develop blossom buds and bring to maturity—such is the grower's hopes—a bountiful crop of good fruit. As blossom bud development takes place towards the end of the growing season, a little reflection will convince the thoughtful orchardist that, if the soil is allowed to harden and weed growth is unchecked, the soil will become deficient in moisture at a time when it is needed by the tree for blossom bud development. This drawback is rendered much more serious in its effects if the season is dry, and if insect pests and fungous diseases affect the tree's vitality.

It is lack of soil moisture that is frequently responsible for the alternate cropping of fruit trees, *i.e.,* a good crop one season followed by a light crop the next season. It is not unusual for a tree, after carrying a heavy crop during one season, to fail to develop many blossom buds the next season, or after blossoming well to fail to set a good crop on account of bud weakness. The cause of failure in very many such cases is lack of soil moisture. It may also, with advantage, be pointed out that a large proportion of the varieties of the fruit grown, especially apples and pears, are late-maturing kinds, which, of course, carry their fruit late into the season. This late hanging of fruit increases the strain of developing blossom buds for the ensuing season. The strain of blossom bud development is, of course, greater in the case of trees indicated than in the case of trees whose fruit matures and is picked earlier in the season.

Care of the Working Horse.

In most orchards the horse is the main source of power used for drawing the various types of cultural implements used, and in order that such power be at its best (this is quite apart from, but not more important than, the question of ordinary humanity) every care should be taken of the horse, which should never be neglected, as he plays a very important part in orchard economy. Proper and regular feeding, watering, grooming, and stabling should all be attended to, otherwise the animal cannot reasonably be expected to do a satisfactory day's work. Occasionally some discomfort is caused the animal through want of thought. Some orchardists place a piece of hessian over the mouth of the horse during cultural operations to prevent his biting the trees as he passes along the rows. This hessian muzzle may prove very distressing to the animal, especially in hot weather, and the discomfort can be obviated or minimised by using coarse gauze or netting instead of hessian. The horse is then able to breathe more freely, even when labouring under a heavy load.

Attention should also be paid to the harness, which should fit neatly, and steps taken to prevent any rubbing that may result in painful sores. Special care should be taken in choosing a collar, as one that is too tight is very distressing, while one that is too large is apt to chafe.

Conclusion.

So far as mechanical aids are concerned, there is now little or no excuse for cultivation being practised in a slipshod manner. A great deal of human ingenuity has been applied to the design and manufacture of

agricultural implements suited to different varieties of crops and to various classes of soil. In actual practice it is not always those who have the most up-to-date implements who do the most effective work. Personal ability, energy, and thoughtfulness are factors of prime importance. To get the best results the work must be done at the right time, and must be done thoroughly. Implements must be properly adjusted, well-cared for, and effectively used. If they do not function satisfactorily the cause, or causes, must be discovered and the defects remedied. Not work, but skilled work; not merely toil, but toil intelligently directed towards a given end, is required. In no industry are keenness of observation, power to draw sound conclusions from ascertained facts, and unwearying industry so insistently required as in agriculture.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 " 1928
Department of Education, Hurlstone Agricultural High School	33	10 " 1928
Department of Education, Eastwood Home	16	16 " 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 " 1928
King Bros., Hygienic Dairy Company, Casula, Liverpool	94	19 " 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 " 1928
Lunacy Department, Callan Park Mental Hospital	20	26 " 1928
Miss Brennan, Arrankamp, Bowral	24	29 " 1928
Mr. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 " 1929
New England Girls' Grammar School, Armidale	17	12 " 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 " 1929
Lunacy Department, Kenmore Mental Hospital	99	17 " 1929
Tudor House School, Moss Vale	6	22 " 1929
Lunacy Department, Orange Mental Hospital	3	22 " 1929
William Thompson Masonic School, Baulkham Hills	29	23 " 1929
Australian Missionary College, Cooranbong	57	24 " 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 " 1929
P. F. Mooney, Calala	33	16 " 1929
Department of Education, Gosford Farm Homes	16	16 " 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 June, 1929
Dominican Convent, Moss Vale	4	26 " 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patricks College, Goulburn	8	26 " 1929
Presbyterian Ladies College, Goulburn	4	26 " 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 " 1929
Department of Education, Mittagong Farm Homes	29	23 " 1929
Blessed Chanel's Seminary, Mittagong	4	25 " 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 " 1929
Walaroi College, Orange	5	30 " 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	114	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct. 1929

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

NOVEMBER.

E. HADLINGTON, Poultry Expert.

ONE of the most important matters for consideration just now is accommodation for the young stock, especially on farms where extra chickens are being reared.

A great deal depends upon how the young birds are handled during the next few months, and every endeavour should be made to give them the best possible conditions so as to keep them growing. This cannot be done if the chickens are kept in small, bare pens after they are about three months old. Very often, under such conditions, they cease growing, lose weight, and become sick, the result being unsatisfactory development and less robust stock. On the other hand, the young stock are often put out into large semi-intensive houses in flocks of 150 and more, which is, to say the least, a dangerous practice on account of the crowding tendencies of young birds, and the results are often as bad as when they are kept in small pens.

The Colony System.

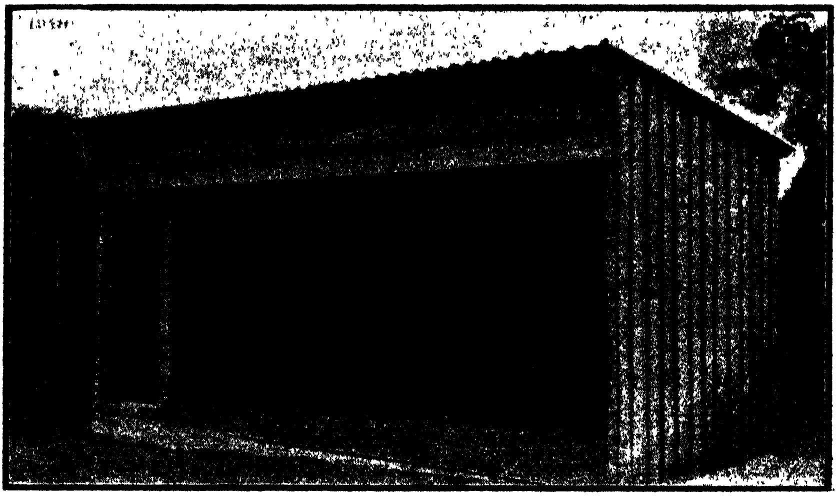
Unquestionably the colony system is the best for the handling of growing stock after they have learnt to roost. The aim should be to give them as much range as possible, and have houses to accommodate about fifty birds only. The objection may be raised that this would entail much more labour than running, say, 150 to 200 birds together in one house, but it must be remembered that from three to six small houses can be placed in one large enclosure, the number of houses depending upon the number of birds being handled and whether there is any great variation in their ages. On the average farm three to four houses to each enclosure will be found the most convenient, and even if there is a little extra labour involved in attending to the birds under this system as compared with the handling of the birds in large flocks, the results obtained will far outweigh any considerations with regard to labour. It is realised, of course, that on some farms space will not permit of such extensive accommodation being provided, but there are many cases where, through lack of system in layout, much space is taken up which could be more profitably devoted to the rearing of young stock.

It may be laid down as a sound principle that the more the young stock are spread out the better they will be in health and development, which, in the end, means that they will be more profitable in every way.

Specifications for Colony House.

The most suitable size for a colony house is 12 feet long by 6 feet wide, and not less than 6 feet high at the front and 5 feet at the back. This will accommodate fifty birds at twelve weeks of age, but the number should be reduced to forty-five when they are about half-grown.

The accompanying illustration shows the construction of the house. Two perches of 3-inch by 2-inch hardwood, spaced 2 feet apart, and 15 inches above the floor, should run the full length of the house.



A Colony House Built According to the Specifications given below.

The materials required for building the house are as follows:—

For top and bottom plates, and for plate to carry weatherboards in front, and also for the two roosts.	8/12′	3″ × 2″ h.w.
For three front and three back studs and fillets for front under weatherboards.	3/12′	3″ × 2″ h.w.
For four rafters	2/14′	3″ × 2″ h.w.
For gate and roost cleats...	3/7′	3″ × 1″ oregon.
Battens for roof	3/12′	3″ × 1″ oregon.
For centre rail to nail palings on to	2/12′	3″ × 1″ oregon.
Weatherbords for front	2/12′	7″ splayed h.w. weatherboards.
Palings for ends	45	6 ft. long.
Palings for back	45	5 ft. long.
Corrugated iron	7 sheets	7 ft. long (26 gauge).
Gutter	2	6 ft. lengths 4″ O.G.
Down pipe	1	6 ft. length 3″.
Brackets	4	4″ brackets for O.G. gutter.

Timber for studs, plates, rafters, &c., can be either hardwood or oregon, except in the case of the bottom plates, which should be of hardwood.

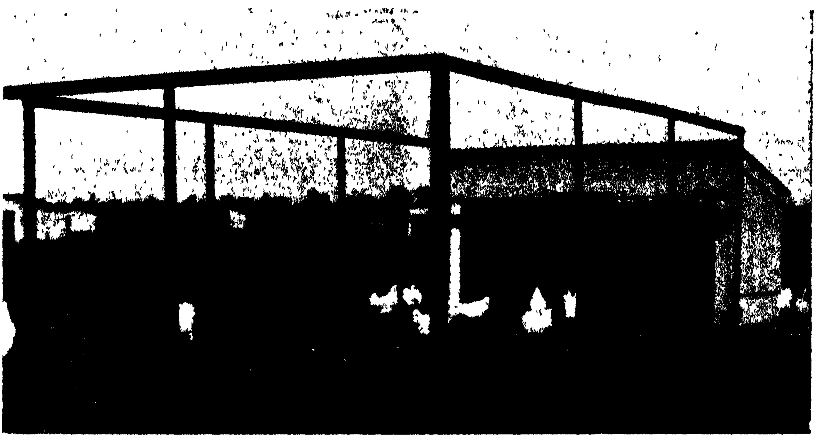
The enclosures for colony houses should be of a size that will allow of at least 5,000 square feet of run for each house, and the houses are best placed on irregular lines at least 10 feet from the fences and not less than 60 feet apart. If they are put closer together, especially if in one row, the chickens are liable to migrate from one house to another.

"Localising" the Chickens.

One of the main essentials in working the colony system is to take advantage of the "locality instinct" of the chickens, and to do this it is necessary to keep them shut in an enclosure around the house for five or six days

after they are first put in. The enclosure can be made with three portable frames, the house forming the fourth side. Such an enclosure is shown in the illustration below.

The frames need only be about 12 feet long, and one set will do for several houses, unless a number of houses are being filled at the one time. After being confined to the small run around the house for nearly a week, the chickens will not go to another house unless attracted there by constant feeding at that point. Therefore, the best plan is to feed in a place equidistant from all the houses, and preferably farthest from the point where the feed is brought in. By observing these few rules no trouble will be experienced in inducing the chickens to remain in their proper quarters.



An Enclosure with Portable Frames Forming Three Sides, the House Forming the Fourth Side.

If sufficient of these houses and runs can be provided it is best to leave the pullets in them until just prior to their coming on to lay, and even then they should not be run in flocks of over 100 until the humid weather is finished. These pens should be allowed to spell for a few months each year so that they may become grassed over again, or, at any rate, become sweetened.

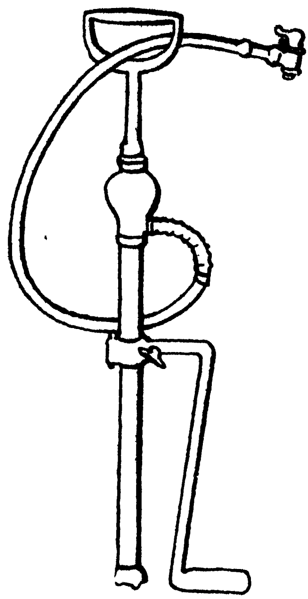
It is advisable, in the hot weather, to have the water supply reasonably close to each house so that the birds will not have to go far in the heat to get a drink.

Watch for Red Mites.

With the approach of summer, red mites, if present in any of the poultry houses, will rapidly increase and cause much loss of production among the layers, or retard the development of the young stock. One of the first signs that mites are becoming numerous is the presence of little white specks at the ends of, and underneath, the perches, and around any crevices near the perches. There is also an accumulation of scurf-like material at the ends of the perches and supports. This material is really the skins of the young

mites, and by this means it can be seen at a glance if the houses are badly infested or not. In cases of very severe infestation a strong odour can be detected in the houses.

The eggs of the mites are laid in crevices in the houses, and during the hot weather they hatch out in a few days, the result being that in a very short time they swarm all over the houses if neglected. When hatched, the young mites are white, but after shedding their skins a few times they assume the adult stage and are of a greyish colour with dark patches on the back. After becoming engorged with the blood of the fowl they vary from a bright red to bluish colour.



A Common Type of Bucket Spray Pump.

Being nocturnal in its habits, this parasite is not found on the birds in the daytime, except, perhaps, on hens that have just come off the nests in a heavily infested house, or on broody hens sitting on eggs. They secrete themselves in the crevices of the house in the daytime, and come out at night to suck the blood of the birds. If numerous enough, they will cause the birds to become pale and poor in condition through loss of blood and irritation, and, in some cases, mortality will result.

Eradication of Mites.

In cases of a light infestation by red mites, and where they are confined to the perches and cleats, they can be exterminated by painting or swabbing with wood oil, creosote, gas residual oil, or kerosene, &c., but when they have spread all over the houses it becomes necessary to spray out the

whole of the houses. For this purpose a cheap and effective spray is kerosene emulsion, which is made as follows:—

> Take ½ lb. of soft soap and dissolve it in a gallon of boiling water, add slowly to this, stirring briskly all the time, 1 gallon of kerosene. Continue stirring the mixture for a few minutes until it is of a creamy consistency. This is the "stock" mixture, and it should be added to 9 gallons of soft water, making 11 gallons of spray. The mixture should be stirred well with the water whilst it is being added, and it is as well to keep the solution stirred occasionally when spraying.

On no account should water containing lime, salt, or any caustic substance be used, as any "hard" water will cause the oil to separate and thus spoil the effect of the spray and render it useless. No attempt should be made to mix all the constituents together at once, because the solution will not emulsify except when made as directed.

It is necessary to spray the houses inside and outside, also the floor, roof, nests, &c. In bad cases at least two sprayings are necessary at intervals of a day or two. The best procedure in spraying is to direct a fine spray into all crevices first, to bring out the mites. These can then be caught by going over the surface again with a somewhat coarser spray.

On farms where the expense of a large spraying outfit is not warranted, a garden bucket spray pump fitted with a hose long enough to reach over the whole of the house will be found to meet all requirements. Such a pump is illustrated on the previous page.

Production of Olive Oil in Australia.

Production of olives in Australia is practically confined to South Australia. That State produced over 30,000 gals. in 1924 and 1925, but in 1926–27 production only amounted to 10,000 gals. During the year 1926–27 Australia imported 150,530 gals. of olive oil valued at £65,155. The principal countries of supply were :—France, 109,961 gals.; Italy, 27,619 gals.; Spain, 3,065 gals.

The world production of olive oil in 1927 of over 2,000 million pounds was a record by a considerable margin. It was about 60 per cent. above the 1926 production, and exceeded the large yield of 1924 by more than 20 per cent. Practically the entire production of olive oil comes from the countries bordering and adjacent to the Mediterranean Sea. Spain, Italy, Greece, Tunis, Portugal, and Algeria, produce well over 90 per cent. of the world's total. French Morocco, Syria, France, Palestine, and Tripoli contribute very nearly all of the remainder.

For the year ended 30th June, 1928, Australia imported artificial silk to the value of £575,992, which showed an increase of £184,245 over the previous year's imports.

Orchard Notes.

November.

C. G. SAVAGE AND W. LE GAY BRERETON.

It is probable that the heavy drying winds that were prevalent during October will adversely affect the setting of fruit on those trees which happened to be in blossom during the windy periods. Strong drying winds apparently hasten the drying off of the stigmas of the flowers and thereby shorten the period during which they are receptive to the pollen grains.

These winds have also had a very drying effect on the soil, in addition to which there has been very little spring rain. It is in seasons such as this that early ploughing to catch the winter rains and allow them to soak into the soil, and subsequent cultivation during the spring and summer to conserve this moisture, show to advantage. As weed growth generally has not been heavy this season, and as the soil in most districts has not received heavy soakings since the spring to compact it, it is probable that it can be maintained in good condition by means of orchard cultivators. But if for any reason it has become too compact for cultivators to deal with satisfactorily, a light ploughing will be necessary to put it into condition again.

Some multiple ploughs with the mouldboards removed can be used for this summer work. With proper care they do not damage the roots any more than the ordinary cultivators. The plough undoubtedly makes the better mulch, in that it is a mulch that arrests the rains and allows them to percolate through the surface better, and such a mulch is not so easily destroyed by light rains. It will often be noticed that the surface left by the plough will need no attention after light rains, whereas the surface left by the cultivator will be cemented together by the same rains and will require breaking up afresh. Any practice tending to reduce the workings of the soil during the summer is a distinct advantage, as the continuous use of implements soon sets up a sole pan, which prevents the percolation of summer rains.

Steep hillsides generally offer the most difficult cultivation problems, as if kept in a loose condition serious washaways will certainly occur during heavy downpours of rain. The only choice here is to choose the lesser of two evils. Some loss of moisture must be put up with and the hillside kept moderately clear of weed growth by shallow chipping only, a little weed growth being necessary to assist in checking washes.

Pests and Diseases.

Codling Moth.—It has been usually found that this pest is more prevalent during dry springs and summers, so that apple and pear growers

should pay special attention this season to all means of combating this pest. Seasonal methods have been described in these notes for some years past and can be obtained in leaflet form from the Department.

Cherry Tree Slug.—A watch should be kept for this pest, and, if it appears, the trees should be sprayed with lead arsenate before the pest becomes numerous. It sometimes takes two or three applications of spray to get this pest under control. Should it first appear on the trees, as it often does, a few days only before the fruit is ready to pick, the spraying, of course, must be delayed till the fruit is harvested.

Black Spot of Apple and Pear.—The weather has not been favourable for the development of this disease in most of our apple and pear districts, and if the dry weather continues the later sprays may not be needed, but if rains occur later on in the season precautions may be necessary to check a late outbreak. In some districts, even in dry seasons, mists occur which supply sufficient moisture to keep this fungus going, and under such circumstances further applications of spray will be necessary.

Black Spot and Downy Mildew of Grape Vines.—Here again the dry weather is unfavourable to the development of the causal fungus, and though it is risky to omit the initial sprays, if dry conditions continue the later sprays of Bordeaux mixture may be unnecessary for black spot, though it is wise to take some precaution against downy mildew in case a wet period should occur.

Leaflets are obtainable free of charge from the Department of Agriculture on the above fungous diseases and also on the mixing of the prescribed sprays.

Summer Training.

It is wise to make periodical inspections during the growing period of young trees, or trees that have been worked over within the last two or three years. Often the growth can be directed and the stronger leaders or unnecessary strong shoots checked so as to form an evenly-balanced framework. Some superfluous strong shoots may be removed altogether if there seems any danger of their sapping some of the desirable strong shoots required for the extension of the framework of the tree. But this should only be done with extreme caution, because if many shoots are removed the remaining shoots are more liable to be broken off by the wind. Moreover, it is by means of the foliage that the new sap from the roots is elaborated for feeding all parts of the tree, and if much foliage is removed the plant is to that extent being starved. In most cases the checking of the undesirable strong shoots by topping is sufficient to prevent them from sapping those required.

The young tender shoots from budded or grafted trees are likely to require tying to prevent their being blown off by winds. The growths from below the grafts or buds should be checked to prevent the sapping of the buds or grafts, but here again for the same reason as given above many of the shoots from the stock should not be removed altogether. A leaflet is obtainable from the Department on the after-care of buds and grafts.

Both in young trees and re-worked trees that are making very rapid growth it is sometimes necessary to top the young leaders to save them from being broken off by the wind. When this is necessary it is preferable to only snap off the tender tops, because if the older woody parts of some kinds of trees are cut, they are seriously stunted. Especially is this so in the case of cherries.

Packing Cherries.

Cherry-picking will be in full swing this month. Those growers who "row in" the face of the box should take care that the fruit used is a fair representation of that underneath. It is not an easy matter to strike the correct average size for the face and most "facers" will unconsciously pick the larger fruit. To overcome this the face can be "bunched in," by picking up the cherries for facing by the stalks and placing them in position in bunches. A bunched face has quite an attractive appearance and can be easily made to fairly represent the fruit underneath.

An Affection of the Eyes Coinciding with Production of Second Quality Cream.

While carrying out the work of dairy farm instruction, a very interesting case of second-quality cream came under notice.

The cream seen at the factory was distinctly bad-smelling and of an albuminous nature—a low second grade. The records of this supplier were examined, and showed that for two years previous to this happening his cream had always been graded "choicest."

A visit was made to the farm, and it was found that the cattle were suffering from what appeared to be a severe attack of an inflammation of the eyes, and on this particular day seventeen cows had contracted the ailment. Some were affected in one eye, others in both eyes. The cows had fallen away considerably in condition and their milk flow had also diminished. On questioning the farmer, he admitted that altogether twenty-two cows had been affected, and he also stated that with the coming of the epidemic so had commenced the grading of his cream as second quality.

A sample of this cream was forwarded to the Biologist for examination and was reported on as follows:—Total count of bacteria per c.c., 300,100,000; kinds, &c., *streptococcus* sp., unusual type and lactics 300,000,000, *B. coli communis* (caused albuminous flavour in cream) 100,000. The sample contained very large numbers of an unusually occurring *streptococcus.* This organism grew rapidly in milk, causing an acid coagulum. The only other organism found in the cream, *B. coli communis,* has frequently been isolated from albuminous-flavoured cream. When this organism was grown together with the *streptococcus* sp., the milk developed a strong vinegar-like odour.

As the cows recovered, so the cream improved, and on a complete recovery being made the cream again became normal and was graded "choicest" at the factory, and has continued so up to date (September, 1928).—C. S. Kentwell, Dairy Instructor.

1*st December*, 1928.

CONTENTS.

VOL. XXXIX. PART 12. DECEMBER 1, 1928.

Agricultural Gazette of New South Wales.

Stem Rust of Wheat.

THE ISOLATION OF RESISTANT TYPES FROM A FEDERATION x KHAPLI CROSS.

H. J. HYNES, M.Sc., B.Sc.Agr., Senior Assistant Biologist.

STEM RUST is one of the most destructive grain diseases in the world, and in certain parts of Canada and the United States is considered to be the greatest single hazard in the production of wheat. Under Australian conditions, however, stem rust is not considered a major disease of cereal crops, although in certain seasons, when rust develops extensively on the upper portion of the stems during the grain-filling period, the damage may be quite serious. In New South Wales the loss caused by stem rust in wheat in 1916 was estimated by the then Chief Inspector of Agriculture to have exceeded £2,000,000. Reports from agricultural instructors show that during the past four years in the northern districts of this State whole fields of Hard Federation wheat were destroyed by stem rust, and that the grain of other varieties was seriously impaired.

Stem Rust and the Causal Fungus.

Stem rust appears late in the season and usually is not observed until the commencement of summer. It occurs on all above-ground parts of the plant, but is most destructive when the stems are attacked. The first signs of infection are pale-yellow spots; these later develop into large reddish-orange areas on which numerous one-celled spores, known as uredospores or summer spores, are produced. They are very small and light and are easily distributed by wind to neighbouring plants where, under favourable conditions, new centres of infection are started. In a badly rusted crop it is common to see the ground reddened with the spore dust from affected plants. As summer advances and the plants mature, the red patches change to black owing to the production of the black resting spores or teleutospores which are incapable of infecting wheat directly; they are able to continue the life cycle only in the presence of the barberry plant.

Waterhouse([9]) has demonstrated that the "barberry stage" of the fungus can be produced by the Australian stem rust under certain conditions, but it is considered that the teleutospore stage serves no useful purpose in the life cycle of stem rust in Australia, since barberry bushes are practically unknown here. In addition, the teleutospores in most sections of the wheat belt appear to have lost their powers of germination by the end of the summer. All sources of rust infections under local conditions can be traced directly to the red spores or uredospores which over-summer on volunteer wheats—a point emphasised by Waterhouse([8]) in 1920.

The severity of a rust attack depends on many factors, but warm weather, with frequent showers and heavy dews, is particularly favourable to its development. The yield from a rusted crop is much reduced and the grain

is generally small and shrivelled. In severe attacks no grain is produced and the flag and stem are worthless for hay, becoming quite brittle and paper-like.

Stem rust of cereals is caused by the fungus *Puccinia graminis,* which attacks wheat, oats, barley, rye, and also a large number of grasses. This fungus, however, is known to consist of a number of strains which vary in their parasitic capabilities so that the strain which occurs on wheat, viz., *Puccinia graminis tritici,* will also attack barley and a number of grasses, but not oats. There is a distinct strain of stem rust on oats, a different one on rye, and a number on certain grasses. Further specialisation in the stem rust fungus has been determined in that a number of the strains of *P. graminis* have been found to consist of a number of *physiologic* or *biologic* forms which differ in their capacity to infect different hosts.

Specialisation of Stem Rust on Wheat.

The present knowledge of this important phenomenon is due largely to the researches of Dr. E. C. Stakman and his associates at Minnesota, U.S.A. Prior to 1917 it was observed and accepted as a fact that Marquis and Kanred wheats were susceptible and resistant, respectively, to stem rust. In 1917, however, "a stem rust of wheat was found to which Marquis was resistant and Kanred was susceptible. The two rusts appeared to be identical as regards size of spores, shape, colour, and so on; structurally they were similar. In their parasitic behaviour only they showed a difference. They were, therefore, said to be different biologic forms of the wheat stem rust."

By the use of other varieties of wheat for inoculation with samples of stem rust collected from various sources it has now been demonstrated in America that there are at least thirty-seven of these biologic or physiologic forms, each of which is referred to by a number, *e.g., P. graminis tritici f.* 37. A definite scheme(9) has been developed whereby the identity of any rust sample collected may be determined according to the infection types obtained when twelve selected varieties of wheat are each inoculated with the unknown rust. Working along similar lines Waterhouse(10) has demonstrated the existence of at least two physiologic forms for stem rust of wheat in Australia. Some commercially-grown varieties are susceptible to both forms, whilst others are susceptible to one form, but resistant to the other.

Breeding for Rust Resistance.

It is generally agreed that the most hopeful method of reducing losses from rust epidemics is in the production of resistant varieties. Some wheats appear resistant to stem rust in the field but often this is due to their early maturity which causes them to ripen off before the rust has developed. In reality such varieties are "rust escaping," and should environmental conditions favour the disease early in the season then they would probably prove quite susceptible. It will be seen, then, that any cultural practice, such as fallowing and the use of superphosphate, which tends to give the plants a good start and which hastens maturity, will sometimes help a variety to escape serious damage following rust infection.

The problem is, however, to produce varieties which are rust resistant rather than rust escaping. The existence of physiologic forms of the stem rust fungus complicates the problem since a variety may prove resistant to one form but susceptible to another. Owing to the possible distribution of forms of stem rust it is clear that certain varieties may be resistant in one locality but susceptible in another—a feature which was actually noted in Australia in 1890 ([6]). If a variety of wheat is to be resistant in a particular area it must prove resistant to all the physiologic forms of stem rust which occur there. The problem of developing, by hybridisation and selection, a variety which possesses resistance to several forms of stem rust and which also has desirable agronomic qualities, is extremely difficult, but successful results in this connection have been obtained in other countries and there is every reason to believe that this method of attack under local conditions is perfectly sound.

It is obvious that the ideal parent for the hybridisation work is a variety which is resistant to all known physiologic forms of stem rust. The emmer wheat, Khapli, possesses extreme qualities of resistance to stem rust, and was used in crossing work with Federation in an attempt to develop a commercial, rust-resistant wheat for Australian conditions. The details of this investigation are outlined in the following pages.

The Federation x Khapli Cross.

Khapli is an early-maturing variety and, according to Stakman and Levine([8] and [7]), is the only wheat known to be resistant to practically all physiologic forms of stem rust. With a view, therefore, to producing a wheat in which were combined the rust-resistant qualities of Khapli and the desirable agronomic features of Marquis, American investigators([2]) attempted to secure a cross between these two varieties, but their efforts were fruitless on account of the high degree of sterility and extreme variability which developed in the hybrids.

Plant breeders at the present time are particularly interested in the possibility of transferring rust resistance from the emmer wheat group to the common wheat group by hybridisation. The fundamental features of the emmer wheats (*Triticum dicoccum*) and of the common wheats (*T. vulgare*) are so strikingly different that it becomes a very difficult matter to combine the desirable qualities of each parent in the progeny from such a species cross.

In the spring of 1921 the writer attempted a cross between Khapli emmer and Federation wheat in the experimental plot at Sydney University. As a result of artificially pollinating about fifteen emasculated flowers of Federation wheat with pollen taken from the Khapli parent, five somewhat shrivelled grains were produced. The F1 plants, four in all, were quite normal and produced heads bearing plump grain. The F2 grain was also sown in the University experimental plot, and in December, 1923 forty-two F2 plants were harvested. Some plants died in the early stages and others lived until the early boot stage and then died. Detailed studies were subsequently made at the University of Minnesota, U.S.A., with reference to type

and reaction to stem rust in plants of the F2, F3, and F4 generations of the cross. This investigation ([4]) led finally to the selection of a number of types which appeared to offer possibilities for future work. The studies in this connection, which are detailed below, were conducted in the Biological Branch glasshouse, Botanic Gardens, Sydney, and at Cowra Experiment Farm.

Glasshouse Infection Studies and Field Tests.

The aim of these investigations was to isolate plants which were resistant to Australian stem rust, and which were also desirable for their agronomic qualities. Accordingly, in 1926 sixty-nine families* from the F4 generation were selected, and, as far as possible, the ten most promising individuals in each were made available for a progeny test. The total number of F4 plants utilised was 394. Portion of the grain from each plant was reserved for stem rust infection tests in the glasshouse, while the remainder was sown in the plant breeder's plots, Cowra Experiment Farm. In this way it was possible to determine the nature of each single plant's progeny both in regard to rust reaction and field characters.

Glasshouse Studies.—About fifteen to twenty grains from each plant selection were sown in loamy soil in 4-inch pots—generally ten grains per pot. When about 3 inches high the plants were moistened with water and fresh uredospores of physiologic form No. 1 of Australian stem rust transferred to the leaves by means of a flat needle. The pots were then placed in a moist chamber for forty-eight hours, and thereafter placed on the glasshouse benches, where they were kept for from eighteen to twenty-one days. As the second leaves emerged they were cut off to allow of full exposure of the first (inoculated) leaves to sunlight. About three weeks from time of inoculation it was possible to determine the degree of rust susceptibility or resistance of the plants according to the type of rust spot or pustule which developed and its effect on the surrounding leaf tissue. The different types of infection obtained are well illustrated in the test figures, and, in accordance with the scheme devised by Stakman and Levine ([7]) are referred to by numerals, each of which designates a certain type of rust reaction, as follows:—

"1"—very resistant.
"2"—moderately resistant.
"3"—moderately susceptible.
"4"—very susceptible.

In some instances the degree of infection for types 1 to 4 was only slight; in such cases the minus sign was employed to indicate this feature, as "1—," "2—," &c.

By means of careful correlation studies American investigators ([2]) have shown that the degree of susceptibility or resistance to stem rust, manifested by seedlings in the glasshouse, is, in general, in agreement with that exhibited by plants of the same variety in the field. Under certain conditions, however, a variety which appears susceptible in the glasshouse may prove resistant in the field. According to Hursh ([8]) this is apparently due to the fact that in older plants the development of thick-walled, fibrous tissue forms a mechanical limitation to the spread of the fungus threads.

* Family-individuals from seed of a single plant selection.

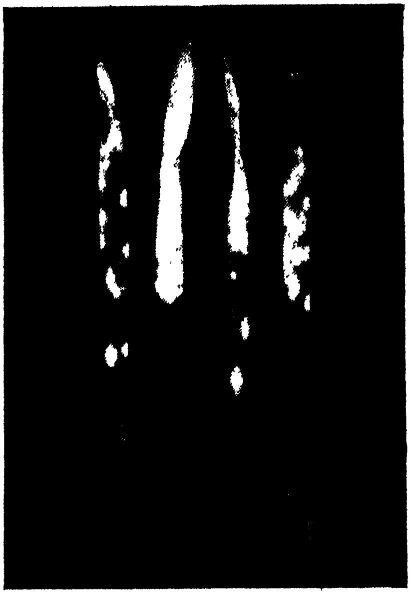


Fig. 1.—Plants Very Resistant.
Type of infection "1."

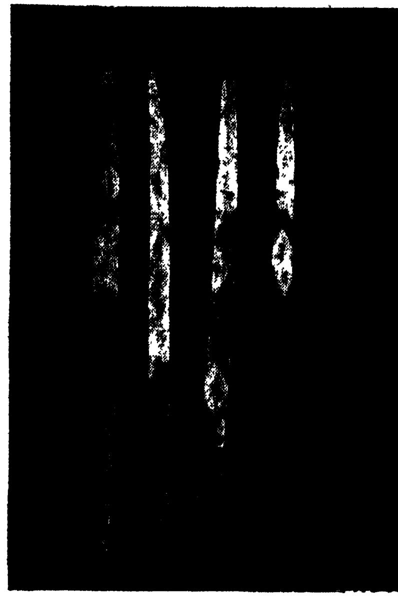


Fig. 2 Plants Moderately Resistant.
Type of infection "2."

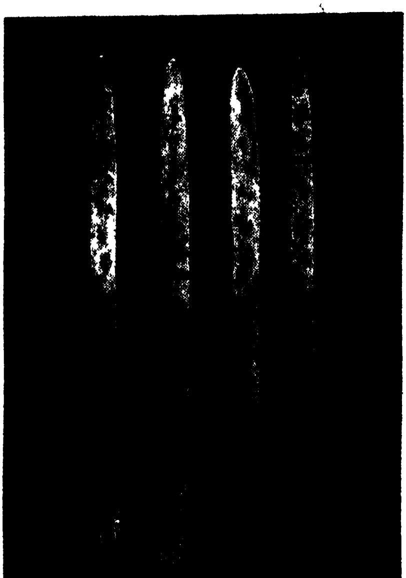


Fig. 3.—Plants Moderately Susceptible.
Type of infection "3."

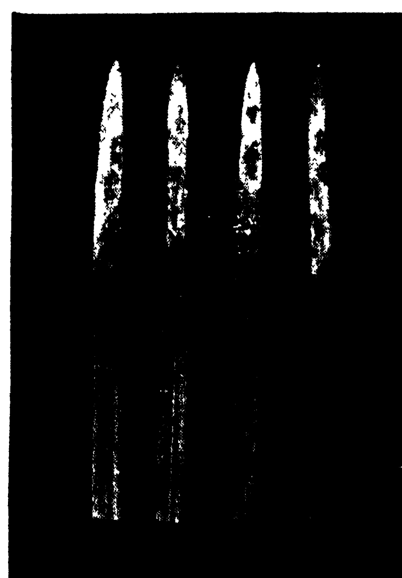


Fig. 4.—Plants Very Susceptible.
Type of infection "4."

Wheat Seedling Leaves Showing Different Types of Rust Development in the Resistant and Susceptible Classes of Infection. Leaves Inoculated with Form No. 2 of Australian Stem Rust (*Puccinia graminis tritici*).

The test of 394 F5 families in the glasshouse involved the inoculation and recording of infection types of 6,000 seedlings. In general the percentage infection obtained from the inoculation tests was very satisfactory—95 to 100 per cent. When the rust reaction for individual seedlings in each F5 family had been recorded according to the above scheme, the reaction for the family as a whole was determined according to the reaction manifested by the several individual plants tested, as follows:—

R—Resistant, individual plants showing infection of types 1 or 2.

HR—Resistant, with some plants susceptible; infection of types 1, 2, 3, or 4—twice as many or more plants in resistant class as in susceptible class.

H—Unfixed for rust reaction; plants mostly distributed evenly in resistant and susceptible classes.

MS—Moderately susceptible; infection of type 3.

HS—Susceptible, with some plants resistant; twice as many or more plants in susceptible class as in resistant class.

S—Susceptible; infection of type 4.

This scheme is a modification of that used by Hayes and Aamodt (⁹).

It will thus be seen that if in one family there were fifteen plants distributed in the 1 and 2 classes of infection and five other plants in the 3 and 4 classes, the rust reaction for that family would be HR; similarly, if four plants each showed a 1 infection, five a 2 infection, eight a 3 infection, and three a 4 infection, the family would then be placed in the H class. On the other hand, if the twenty tested individuals distributed themselves in the 1 and 2 classes of infection the family would be considered resistant and classed as R; if the distribution was in the 3 and 4 types of infection the family would be susceptible and classed as S. No further examples are necessary, but the manner in which the scheme works is indicated clearly in Table 5.

Field Tests.—As stated above, portion of the grain from each F4 plant selection was reserved for planting in the field at Cowra Experiment Farm. Generally about 30 grains from each single plant were sown in short rows in the breeding plots, and as the plants approached maturity observations were made by Mr. J. T. Pridham, Plant Breeder, as to the period of maturity and general agronomic value of each family.

Results in 1926.

As a result of the glasshouse infection studies described above it was possible to state exactly the stem rust (physiologic form No. 1) reaction of each family growing in the field. Consequently, during the inspection of the F5 plants in company with Mr. Pridham, only those families which appeared promising from the agronomic standpoint, and which also were rust-resistant or largely resistant, were marked for further investigation in 1927.

The results of the work conducted in 1926 are briefly summarised in Table 1. It will be seen that out of 394 F5 families tested, thirty-eight were resistant (R) and twenty-three largely resistant (HR). In the former class there were nine families and in the latter class seven families which appeared promising in the field.

TABLE 1.—Numbers of F5 families of Federation x Khapli in the agronomic and stem rust reaction classes.

Agronomic Class.	Stem Rust Reaction Classes.*						Total No. of Families.
	R.	HR.	H.	MS.	HS.	S.	
Desirable	9	7	6	7	5	45	79
Undesirable	29	16	34	26	20	190	315
Total No. of Families	38	23	40	33	25	235	394

* Form 1 of Australian Stem Rust.

Experiments in 1927.

On the basis of results obtained in 1926, the grain from several individual plants in each of twenty-three F5 families, matured at Cowra Experiment Farm, was harvested for further field and glasshouse infection tests. The number of individuals harvested in each family selected varied somewhat, but the total number of F5 plants utilised for a progeny test was 549.

Portion of the grain from each plant was reserved for field tests at Cowra and the remainder utilised for the glasshouse infection studies with two physiologic forms of stem rust. The yield from each F5 plant selection was more than sufficient for the threefold nature of the investigation. In the rust work, the reaction of each F6 family to physiologic form No. 1 was first determined and then fresh grain sown to raise plants for inoculation with form No. 2. The stem rust phase of the work involved the sowing of grain, inoculation, excision of second leaf, and recording of infection types for almost 16,000 seedlings.

The general methods of procedure in both field and glasshouse tests were the same as those used previously, as also were the methods of recording results. Finally, when the field behaviour of each family was known and the reaction to two forms of stem rust determined, selections for further work were made on the same basis as in 1926.

Results in 1927.

In Table 2 the numbers of families with different combinations of reaction to the two forms of stem rust are given. Thus it is seen that there were eleven families resistant to both forms, 209 resistant to form 1, but susceptible to form 2; eighteen resistant to form 2, but susceptible to form 1; and thirty-three susceptible to both forms.

TABLE 2.—The classified reaction of individual F6 families of Federation x Khapli to forms 1 and 2 of Australian stem rust.

Reaction to Form 2.	Reaction to Form 1.						Total No. of Families.
	R.	HR.	H.	MS.	HS.	S.	
R.	11	3	11	20	4	18	67
HR.	2	0	0	2	0	3	7
H.	0	0	1	1	1	0	3
MS.	78	7	8	31	12	14	150
HS.	3	0	0	2	1	1	7
S.	209	13	6	30	6	33	297
Total No. of Families ...	303	23	26	86	24	69	531

A complete summary of the experimental data for 1927 is given in Table 3. No explanation of the table is required but it is interesting to note that in the promising agronomic class there were four families resistant to both forms of rust and that of these one was early-maturing and three were of the mid-season type. In the undesirable agronomic class there were seven families resistant to both forms of rust. Of these three were early maturing, three mid-season maturing, and one late maturing.

TABLE 3.—Summary of results showing the number of F6 families of Federation x Khapli in the several maturity groups of desirable and undesirable agronomic classes together with their distribution in the various combinations of reaction to forms 1 and 2 of Australian stem rust.

Family Reaction to Stem Rust.		Agronomic Classes.								Total Number of families.
		Desirable.				Undesirable.				
		Maturity.				Maturity.				
Form 1.	Form 2.	Early.	Mid-season.	Late.	No. of Families.	Early.	Mid-season.	Late.	No. of Families.	
R.	R.	1	3	...	4	3	3	1	7	11
	HR.	1	1	...	2	...	...	...	...	2
	H.	...	...	...	...	...	...	...	...	...
	MS.	41	15	...	56	...	17	5	22	78
	HS.	3	...	..	3	...	...	...	...	3
	S.	123	31	...	154	...	55	...	55	209
HR.	R.	...	1	..	1	...	...	2	2	3
	HR	...	...	..	...	...	...	...	...	...
	H.	...	...	..	...	...	...	...	...	...
	MS.	...	3	...	3	...	3	1	4	7
	HS.	...	...	..	...	...	...	...	...	...
	S.	1	1	...	2	...	11	...	11	13
H.	R.	...	1	...	1	7	2	1	10	11
	HR.	...	...	..	..	...	...	...	...	...
	H.	...	1	...	1	...	...	...	...	1
	MS.	...	3	..	3	...	2	3	5	8
	HS.	...	...	...	...	...	...	...	...	...
	S.	2	...	...	2	...	3	1	4	6
MS.	R.	...	3	..	3	4	1	12	17	20
	HR.	...	...	...	...	...	1	1	2	2
	H.	...	1	...	1	...	...	...	...	1
	MS.	...	7	...	7	...	6	18	24	31
	HS.	...	...	...	...	...	1	1	2	2
	S.	3	...	...	3	...	6	21	27	30
HS.	R.	...	2	...	2	1	...	1	2	4
	HR.	...	...	...	...	...	...	...	...	...
	H.	...	...	...	...	...	...	1	1	1
	MS.	...	2	1	3	...	3	6	9	12
	HS.	...	...	...	...	...	...	1	1	1
	S.	...	1	...	1	...	3	2	5	6
S.	R.	...	4	...	4	3	8	3	14	18
	HR.	...	...	...	...	...	3	...	3	3
	H.	...	...	...	...	...	...	...	...	...
	MS.	...	2	...	2	...	6	6	12	14
	HS.	...	...	...	...	...	1	...	1	1
	S.	1	6	2	9	...	15	9	24	33
Total No. of Families		176	88	3	267	18	150	96	264	531

The outstanding features of interest in Table 3 are presented in clearer form in Table 4. From these data it is seen that seven families possessed promising agronomic characters and were also largely resistant to both forms of stem rust. Two of these families were early maturing, whilst the remaining five were of the mid-season maturing type.

TABLE 4.—Number of agronomically desirable F6 families of Federation x Khapli in the several maturity classes, which contain a large number of individuals resistant to steam rust (R. and HR.).

Reaction to Stem Rust.	Maturity			Total No. of Families.
	Early	Mid-season.	Late.	
Resistant to Form 1 ...	170	55	0	225
Resistant to Form 2 ...	2	15	0	17
Resistant to Forms 1 and 2	2	5	0	7

In order to give some idea of the distribution of individual plants of a family in the several classes of infection obtained with the two forms of stem rust, Table 5 was prepared and data are presented there for certain promising F6 families which possessed various combinations of reaction to the two forms of rust tested.

TABLE 5.—The reaction of selected agronomically desirable F6 families of Federation x Khapli to forms 1 and 2 of Australian stem rust.

F6 Family No.	Stem Rust Form No.	Distribution of F6 plants according to the Type of Infection shown.								Number Plants Infected.	Reaction of Family.
		1 —	1	2 —	2	3 —	3	4 —	4		
K15	1	11	...	...	...	.		..	...	11	R.
	2	...	...	...	17	..		..	...	17	R.
H15	1	2	5	5	3	...	...	...	...	15	R.
	2	...	...	...	14	...	3	...	...	17	HR.
F7	1	3	3	...	...	6	..	..	...	12	H.
	2	...	10	...	...	...	...	...	...	10	R.
U20	1	10	3	...	...	...	...	...	...	13	R.
	2	...	...	...	...	8	20	...	...	28	MS.
U61	1	9	9	...	...	...	...	...	...	18	R.
	2	...	3	...	...	1	15	2	...	21	HS.
U62	1	9	6	...	...	...	...	...	...	15	R.
	2	...	...	...	...	...	...	...	18	18	S.

In conclusion it might be stated that this investigation has demonstrated the possibility of obtaining from a species cross in wheat (*Triticum vulgare* x *T. dicoccum*) fixed types which possess desirable agronomic qualities and

also resistance to at least two physiologic forms of stem rust. It is hoped that subsequent investigations will demonstrate that such types are resistant to other forms as yet untested.

The writer desires to acknowledge his indebtedness to Mr. J. T. Pridham for his co-operation in the field aspect of the problem; to Mr. W. L. Waterhouse who supplied material of the two forms of stem rust for the initial inoculations; and also to Dr. R. J. Noble, Biologist, under whose supervision the investigation was conducted.

Summary.

1. In 1921 a successful cross was made between Federation wheat (*Triticum vulgare*) and Khapli emmer (*T. dicoccum*).

2. A study was made of plant types, fertility, and reaction to stem rust in the hybrids at Minnesota Agricultural Experiment Station, U.S.A., in 1924-25.

3. The most promising families in the F4 generation were subsequently investigated for their agronomic qualities and reaction to form 1 of Australian stem rust at Cowra Experiment Farm and the Biological Branch glasshouse, respectively. Out of 394 F5 families tested, nine were completely resistant and also possessed desirable field characters.

4. In the F6 generation, 549 families were studied for their agronomic qualities and reaction to two forms (Nos. 1 and 2) of Australian stem rust. There were sixteen families which possessed a large number of individuals resistant to both forms of rust and of these seven were of promising agronomic character.

5. The significant feature is that four F6 families were isolated which were completely resistant to both forms of stem rust tested, and were also fixed for general agronomic qualities, considered to be of a promising nature.

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Farmers' Experiment Plots.

SUMMER GREEN FODDER TRIALS, 1927–28.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

(1) SORGHUM GREEN FODDER VARIETY EXPERIMENT.

THE trials conducted on the South Coast during the 1927-28 season with varieties of sorghums suitable for dairy farm stock were productive of some good returns.

The following farmers co-operated with the Department in carrying out the trials:—

T. J. Kelly, Tanja, Bega.
H. E. Hunt, Menangle.
E. L. Smith, Dapto.
J. W. Childs, Mt. Hunter, Camden.
J. H. Tarlinton, Cobargo.
Col. T. E. W. Irwin, Bega.

The soils and situations of the plots varied. At Camden the soil was of the Wianamatta shale formation, the plot being on a flat; at Tanja it was basalt and on a flat; at Bega, granite hillside; Dapto, sandstone hillside; Menangle, Wianamatta shale hillside; Cobargo, granite hillside.

The Season.

The season was favourable to the production of good returns, the rainfall being good—a little too much in some cases. The winter was not by any means a cold one; few frosts were experienced and the sorghum crops carried over in the paddocks right into September, retaining their succulence more or less. Moreover, red stain disease was not so troublesome as on other occasions, no doubt due to the absence of westerly winds which generally prevail in the early spring months.

Behaviour of the Varieties.

Germination was good, although on some plots White African was slow in coming through the ground.

The plots throughout were treated with superphosphate at rate of 2 cwt. per acre. The seed was drilled in, in every case, rows being about 3 feet apart, and the seed dropped in the rows by means of the corn-planter using a ten-hole sorghum plate and the fast gear. The quantity of seed used was from 4 to 5 lb., according to the size of the seed.

Of the varieties tried out White African showed up as the most consistent yielder. This variety is very much fancied by dairy-farmers on account of its yield and palatableness, and because it retains its succulence through the winter. If it is desired to grow it for seed purposes, it must be sown in October, otherwise, on account of its late maturity, it will not set seed.

Collier is also attracting attention, and is favoured by some who like the fine stems. It stands well, although it is not so late in maturing as White African.

Saccaline grew well and upheld its reputation as a good fodder variety. Cowper variety (previously known as Sorghum 61) also showed to advantage. Gooseneck has, after a number of trials, been discarded in favour of the other varieties mentioned, and Feterita will not be tried again as there is no doubt about its being unsuitable.

South Coast Sorghum Green Fodder Variety Trial.

	T. J. Kelly, Tanja.	H. E. Hunt, Menangle.	E. L. Smith, Dapto.	J. W. Childs, Camden.	J. H. Tarlinton, Cobargo.	Col T. E. W. Irwin, Bega.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Gooseneck ...	17 18 0 0	16 5 0 0	14 12 0 0	27 12 0 0	22 11 0 0	16 5 0 0
Collier ..	24 12 0 0	21 16 0 0	13 13 0 0	28 2 0 0	31 17 0 0	23 0 0 0
Felerita ...	9 2 0 0	9 13 0 0	7 10 0 0	14 16 0 0	15 5 0 0	11 8 0 0
Cowper ..	17 18 0 0	17 4 0 0	12 5 0 0	26 17 0 0	34 0 0 0	16 3 0 0
White African ...	25 17 0 0	27 16 0 0	19 16 0 0	29 14 0 0	29 9 0 0	21 13 0 0
Saccaline ...	27 11 0 0	31 4 0 0	11 6 0 0	24 11 0 0	26 15 0 0	16 14 0 0
Sown (1927) ...	31st Oct.	5th Dec.	15th Dec.	3rd Dec.	10th Nov.	19th Oct.
Harvested (1928)	24th Mar.	18th April	3rd May	28th April	22nd May	18th June
Rainfall ...	1,570 points	......	1,695 points	1,724 points	2,442 points	......

(2) MAIZE GREEN FODDER FERTILISER EXPERIMENT.

Experiments to ascertain the effect of artificial fertilisers on maize in the direction of increasing the bulk of green fodder per acre were conducted on the South Coast during the past season. Plots were established in nine different centres.

The following farmers co-operated with the Department in carrying out the work.

Lindsay Evans, Dapto.
H. E. Hunt, Menangle.
A. Chittick, Kangaroo Valley.
The late Roy Garrad, Milton.
H. F. Sawtell, Cobargo.
J. W. Childs, Camden.
A. C. Brown, Exeter.
C. T. Hindmarsh, Gerringong.
E. Mathie, Albion Park.

An ideal site where uniform soil conditions are available is hard to get in all cases, although an honest endeavour is always made to provide uniformity in soil and cultural methods. The soils and sites selected were:—Milton, sandy loam hillside; Dapto, basalt dark loam flat; Menangle, Wianamatta shale hilltop; Kangaroo Valley, sandstone, medium loam flat; Cobargo, granite light loam hillside; Camden, Wianamatta shale light loam flat; Gerringong, basalt heavy dark loam flat; Exeter, basalt medium red loam flat; Albion Park, basalt medium loam alluvial flat.

Previous experiments had shown that superphosphate exerts a beneficial effect on the growth of the plants, but it remained to be proved whether fertilisers containing nitrogen and potash—superphosphate contains

phosphoric acid—could be profitably added. A start was made this season by using a mixture of five parts superphosphate and two parts sulphate of ammonia—known as M16—on all plots, for comparison with superphosphate alone.

The Plots.

Weather conditions favoured a satisfactory germination of the seed, the season being one of the best for many years. In most cases the land received an early preparation by winter ploughing, followed by another ploughing prior to sowing, the soil being reduced to a fine tilth by harrowing and rolling. The seed and fertiliser were sown by means of the corn-planter. The drills were spaced at 2 ft. 6 in. between the rows, the grain being dropped in the rows at the rate of about 30 lb. per acre. The variety used was Fitzroy; on several plots a section was also sown to Mexican June—a variety recently introduced by the Department and which gives promise of being a very suitable green fodder variety.

The weights shown in the following table were obtained by cutting a section of fair average growth when the grain in the cob was approaching the dough stage.

ACRE Yields in Maize Green Fodder Fertiliser Experiment.

	L. Evans, Dapto.	The late Roy Garrad Milton	H. E. Hunt, Menangle	A. Chittick, Kangaroo Valley	H. F. Sawtell, Cobargo	J. W. Childs, Camden	C. T. Hindmarsh, Gerringong.	A. C. Brown, Exeter.	E. Mathie, Albion Park.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Superphosphate (140 lb. per acre) ...	24 17	16 4	26 11	34 7	12 8	33 5	34 9	16 17	22 15
Basic superphosphate (176 lb. per acre) ...	25 1	18 6	25 0	31 3	11 1	31 5	24 15	23 2	28 11
M16* (196 lb per acre) ...	30 17	12 4	27 10	32 18	11 16	40 0	16 17	37 5	24 17
No manure	23 17	11 7	21 16	24 5	7 19	....	22 19	15 5	26 1
Sown (1927) ...	11 Nov.	2 Nov	5 Dec.	28 Oct.	2 Dec.	3 Dec.	7 Dec.	1 Nov.	6 Dec.
Harvested (1928) ..	13 Mar.	23 Mar	18 April	28 Mar.	19 June	12 April	21 Mar.	5 May	13 April
Rainfall (covering period of growth) ...	points. 1,138	...	....	points. 2,012	.. ...	points. 1,724	points 1,921	points. 2,420	points. 1,778

* M16 fertiliser consists of 5 parts superphosphate and 2 parts sulphate of ammonia.

The yields as shown above still point to superphosphate as being a safe and profitable fertiliser to use when applied at the rate of 1 to 2 cwt. per acre on maize crops. Of late years superphosphate has come into almost general use in some South Coast districts.

Murrumbidgee Irrigation Areas.

E. B. FURBY, H.D.A., Agricultural Instructor.

SORGHUM VARIETY AND FERTILISER TRIALS.

During the past few years on the Mirrool area there has been practically no demand and very little need for growing summer green fodder crops, but early in the spring of 1927, on account of the drought then prevailing on the surrounding dry area, a big demand for land on which to grow summer

crops for grazing purposes became apparent. Very attractive prices were offered to lease irrigation country and various offers made to leaseholders to grow grazing crops at figures which then appeared to be very payable propositions. As a result of the demand brought about by the drought, a considerable area was ultimately planted with sorghum, millet, and Sudan grass. When the drought broke in early summer it was found that the summer crops sown on thousands of acres were not required, and the question arose as to what was best to do with them. The millet and the Sudan grass were easily enough disposed of, but the sorghum crops presented greater difficulties in economic handling, and were for the most part destroyed, which, in many respects, was regrettable. The varieties grown were Early Amber Cane, Planter's Friend, and Saccaline, all of which grow fairly tall. In the absence of supplies of seed of other varieties which grow less vigorously, but which would nevertheless serve the same purpose almost equally as well, and at the same time be more economical to handle, there was no alternative but to sow the varieties mentioned.

The Variety Trial.

In view of the rush to grow these crops as a commercial proposition, the opportunity was taken to arrange a few trials with varieties of sorghum less known to the district. Unfortunately only one trial was sown, and that on Farm No. 1,624, owned by Mr. F. Brumby, Yenda.

Although the yields were not exceptionally high, and do not reflect the true production under irrigation conditions from crops of sorghum, the observations on the varieties should serve as a future guide when similar circumstances arise as existed last year, or where it is necessary to handle a large area of crop with a binder for converting into silage, &c.

In this trial the following varieties were grown, giving the acre yields indicated:—

	t.	c.	q.	lb.
Cowper (Sorghum No. 61) ...	5	1	3	2
Gooseneck ...	4	12	1	8
Sumac ...	6	18	1	4
White African ...	7	7	1	24
Saccaline ...	7	19	1	11

Although not giving the highest yields, it will be seen that Sumac and Cowper (Sorghum No. 61) would be the most suitable varieties to handle in a large way with a binder.

These plots were sown on the 5th October, 1927, and harvested when the seed was ripening early in March, 1928, 10 lb. of seed per acre being used, which was sown through every second tine of the wheat drill set to sow 20 lb. of wheat to the acre. It is considered, however, that even with the coarser growing varieties, if the seed was sown through every tine, using half as much again or twice the amount of seed per acre, that the crop would be more easily handled with the binder. Superphosphate at 60 lb. per acre was sown with these varieties, and only one irrigation was given.

Saccaline.—A late variety which grew up to 10 feet high, with very coarse stalks, though containing a large amount of sweet juice. This variety was too tall to cut with a binder.

White African.—This variety was a little earlier than Saccaline and yielded almost equally as well. The stalks were finer, and it had every appearance of being a suitable variety for the district, though it grew too tall to be handled with the binder.

Sumac.—This is a similar variety to Cowper (Sorghum No. 61), and would be a very suitable one for cutting with the binder. It is fairly early maturing and much earlier than Saccaline. It has very fine stalks and dense foliage, and does not grow very high—6 feet at the most.

Gooseneck.—This is also an early variety and a very vigorous growing type, reaching 8 feet; has very coarse stalks and would not be altogether a suitable variety for binder work.

Cowper (Sorghum No. 61).—This was the earliest variety of all and was particularly suitable for cutting with the binder. The stalks of this variety are fine and in this trial only grew 6 feet high in the highest part of the crop.

The Fertiliser Trial.

A fertiliser trial was also sown on this farm, using the Saccaline variety with the following results:—

	t.	c.	q.	lb.
No manure	8	0	1	20
Superphosphate (60 lb per acre)	7	19	1	11
„ (140 „) . .	5	8	0	4
M17 (210 lb per acre)	5	4	1	0
M23 (182 „)	5	6	1	0

M17 mixture contains 2 parts superphosphate and 1 part sulphate of ammonia; and M23 mixture contains 10 parts superphosphate and 3 parts sulphate of potash.

From this it will be seen that the benefits of fertiliser to sorghum are not very manifest. The greatest difference seen in the crop was in the young stages when the manured plots certainly appeared to be much superior. The fact that the no-manure plot yielded best should not be attributed to the absence of fertilizer, but to some external influence such as uneven watering during the irrigation. Leaving this plot aside, it appears that all sorghum requires is a moderate application of superphosphate, in the vicinity of 60 or 70 lb. per acre, and that no benefits accrue from the addition of sulphate of ammonia to the superphosphate, as with the M17 mixture, or by the addition of potash to the superphosphate as in the case of M23 mixture.

THE CLOVER TREE (*Goodia lotifolia*) FOUND TO BE POISONOUS.

THE Poison Plants Committee of the Council for Scientific and Industrial Research (which includes three officers of the Department of Agriculture) reports that the above-mentioned plant has been found to be cyanogenetic. Fresh plants show a high content (0.23 per cent.) of HCN (hydrocyanic acid). It has also been found that loss of HCN occurs during the drying of the plant.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1928 :—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits ...	707,267	315,831
,, Tomatoes..	139,869	...
	lb.	lb.
Canned Fruits ..	59,234	2,660
Dried Fruits—		
Unspecified ...	12,026	1,372
Currants ...	11,872	392
Raisins ..	7,322	616
Apricots ...	364	..
Apples ...	3,696	...
Peaches ...	560	...
Pears	112	...
Prunes ...	1,904	336

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	2,469
Bananas ...	....	4,250	...
Lemons ...	....	12	1,663
Oranges ...	....	123	16,720
Grape Fruit ...	....	1	6
Pears	....	...	217
Pineapples ...	....	...	1,780
Other	....	743	15,741
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches.	South Africa ...	18,750	...
	U.S.A.	3,500	...
	China	50	...
Apples ...	....	...	669
Apricots ...	....	...	1,224
Currants ..	....	...	41,779
Prunes ...	France	307	1,280
	U.S.A.	105,712	...
Peaches ...	....	...	418
Raisins—			
Sultanas ...	U.S.A.	50,375	4,172
Lexias . .	....	...	128
Other ...	Spain	145	1,217
	U.S.A.	29,200	..
Dates	Mesopotamia ...	38,978	5,233
Other—	....	...	3,059
	Asia Minor ...	2,700	...
	China	7,706	...
	Turkey	1,560	...
	U.S.A ..	80	. .
Preserved in liquor—			
Apricots ...	....	...	398,930
Peaches ...	....	...	241,105
Pears ...	....	...	9,538
Pineapples ...	....	...	605
Raspberries	....	...	2,484
Other ...	....	...	17,156

An Achievement in Wheat Breeding.

It seems that Waratah has now definitely replaced Canberra as the leading early wheat of the State, and this may be regarded as a great tribute to the wheat-breeding work of the Department. Canberra has been grown to the extent of nearly 500,000 acres in New South Wales, and its replacement on half this area by Waratah probably places a value of £100,000 annually on the plant-breeder's efforts in evolving this latter variety. A sterner task in the replacement of Waratah by something superior to it now lies before the plant-breeder, but there are already signs that Aussie and Bobin, two more recent Departmental productions, will prove superior to Waratah in some districts at least.—H. Wenholz, Director of Plant Breeding.

NECESSARY

BOOKS

FOR THE

Farmer, Grazier, Orchardist and Vegetable Grower.

Issued from
THE GOVERNMENT PRINTING OFFICE.

Farmers' Experiment Plots.

MAIZE TRIALS, 1927–28.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE maize trials in this district during the past season were conducted in co-operation with the following farmers:—

V. Brown, Condong, Tweed River.
D. Sullivan, Stratheden, Casino.
C. S. Oliver, Horse Ridges, Casino.
D. E. Weekes, Carr's Creek, Grafton.
T. Grainger, Southgate-road, Grafton.
G. Parnell, Southgate, Clarence River.
A. E. Collins, Lawrence, Clarence River.
J. McPhee, Palmer's Channel, Clarence River.
M. McBaron, Raleigh, Bellinger River.

The trials at Condong, Stratheden, Carr's Creek, Grafton, Southgate, and Lawrence were unfortunately destroyed by the floods in February. The manurial trials at Horse Ridges, Palmer's Channel, and Raleigh, being situated on fairly high land, were not damaged to any great extent.

The Season.

The season was a very wet one, the rains during the early part of the growing period being excellent, but severe floods were experienced in February. Heavy rains since that month caused the rivers to rise fairly high for short periods, inundating all low-lying areas.

All grain crops grew very well, and were of excellent appearance during the growing period, but with the continuous rains and dull weather during the autumn they did not ripen as well as the earlier stages of growth gave promise of.

The rainfall was as follows:—

	Casino.	Palmer's Channel.	Raleigh.		Casino	Palmer's Channel.	Raleigh.
1927—	Points.	Points.	Points.	1928—	Points.	Points.	Points.
December ...	119	313	...	April ...	738	495	1,554
1928—				May... ...	229	517	335
January ...	651	395	1,104	June ...	257	370	1,067
February ...	816	682	1,338	July ...	56	...	311
March ...	524	246	623				
					3,390	3,018	6,332

The Plots.

Horse Ridges.—This plot was situated on heavy black volcanic soil which had been previously cropped with oats. The land was ploughed in August,

November, and December, and then worked down into a seed-bed. Planting was carried out in rows 4 feet apart on 23rd December, 1927, and harvested on 11th July, 1928.

Palmer's Channel.—Soil, alluvial loam, previously cropped with sugar-cane; ploughed in August and worked several times. A second ploughing was given in December, and then worked down into a seed-bed. Planted 23rd December, 1927; harvested 6th July, 1928.

Raleigh.—Soil, alluvial loam; previous crop, maize. The land was ploughed in September, November, and December. The disc harrow was used after the second and third ploughing. A light harrowing was given just prior to planting. Planted 22nd December, 1927; harvested 25th July, 1928.

RESULTS of Maize Fertiliser Trial.

	No Manure.		Superphosphate 2 cwt. per acre.		Increase	
	bus.	lb.	bus.	lb.	bus.	lb.
Horse Ridges	38	41	54	44	13	3
Palmer's Channel... ...	32	11	39	54	7	43
Raleigh	59	32	75	53	14	21

The variety used in these trials was Fitzroy, and the average increase over no manure, due to the application of 2 cwt. superphosphate per acre, was 11 bushels 41 lb. per acre.

THE TREND OF THE WHEAT-GROWING INDUSTRY.

DURING the past three decades there has been a great expansion in the wheat-growing industry, particularly in the outer western districts with low rainfall. Notwithstanding the fact that in each decade more wheat has been grown in those districts where the climatic conditions are less favourable, the average yield has been consistently increased as indicated below:

Season.	Average Yield.
1892-1901	10.02 bushels per acre
1902-1911	11.04 "
1912-1921	11.62 "
1922-1925	12.57 "

In recent years the total area under wheat has not shown any marked increase. A considerable area of new land has been brought under cultivation in the west and south-west, but in older districts there has been a decrease. This does not actually indicate a retrogression in regard to agriculture, but is largely due to the fact that wheat is an excellent pioneer crop and prepares the land for more intensive farming which, in the older districts, has led to a reduction in wheat acreage, and to an expansion in the fat-lamb raising industry, and mixed farming generally.—A. H. E. MCDONALD, Director of Agriculture.

Cereals at Glen Innes Experiment Farm.

REVIEW TO 1928.

C. McCAULEY, Experimentalist, and J. T. PRIDHAM, H.D.A., Plant Breeder.

THE chief cereal grown on the Northern Tableland, which the breeding work at Glen Innes Experiment Farm is designed to benefit, is oats for hay, mainly for the Sydney market. Maize and oats are the chief crops of farmers in this district, the oats being sown as a winter or spring crop in a two-year rotation with maize, or two or three crops of oats being grown consecutively, and then followed with maize in a three- or four-year rotation. When oats directly follow maize, it is not possible to sow before winter or spring, and it is mostly necessary, and generally desirable, that these oats should be sown in spring, and as much time as possible given to the preparation of the land during the winter. When oats follow oats, they may be sown in autumn or winter. Spring-sown oats succeed so well, especially with the right varieties, that these are the sorts mostly grown in the district, and even when there is the chance to sow oats in autumn and winter, the same oats are sometimes grown, or the sowing delayed till spring. The area of oats sown for hay is about four times that sown for grain.

The Scope of the Experiments.

The groups and objectives in the cereal breeding work at Glen Innes Farm are as follows :—

1. Very late hay oats (spring sown) ..	Standard, White Tartarian.
2. Very late grain oats (spring sown)	Standard, White Tartarian.
3. Late hay oats (autumn sown)	Standard, Algerian.
4. Late grain oats (autumn sown) ...	Standard, Algerian.
5. Mid-season to early hay oats (winter sown) ..	Standard, Guyra.
6. Mid-season to early grain oats (winter sown)	Standard, Guyra.
7. Very early grain wheat (spring sown)	Standard, Clarendon.
8. Very early hay wheat (spring sown) ..	Standard, Clarendon.
9. Very late grain wheat (autumn sown) ...	Standard, Genoa.
10. Very late hay wheat (autumn sown) ..	Standard, Genoa.

Observations in the breeding plots are used to make recommendations as to which varieties should be tested in the farm variety trials and in districts of similar climatic conditions.

OATS.

Very Late Hay Oats (Spring Sown).

Stem rust is rather prevalent in spring-sown oats, and White Tartarian (a side-bearing type, and the standard in this group) is one of the very few varieties that are fairly resistant to this ravaging disease. Many varieties have been tested from different parts of the world, and most of these have

gradually been discarded on account of their greater susceptibility to rust. In 1913, varieties such as Danish Island, Tartar King, Storm King, Abundance, Algerian Tartar, Big Four and Cape were discarded on this account.

Two varieties, White Ligowo and Hutchinson's Potato, were carried on till 1917, and field tests in comparison with White Tartarian gave the following average yields per acre over a six-year period :—

	tons	cwt.
White Tartarian	2	6
White Ligowo	2	8
Hutchinson's Potato	2	4

Because of their much greater susceptibility to rust, these two varieties were then discarded, though White Ligowo, on account of its yielding capabilities, was used for cross-breeding, particularly with Algerian. From it the well-known varieties Lachlan, Guyra, Budgery and Gidgee (mostly mid-season to early varieties) were evolved.

A promising selection from White Tartarian, viz., Reid, was made by a farmer and developed by the Department, and it has always compared fairly well with its parent variety in the plant-breeder's plots. In field trials at Glen Innes Farm it has given the following results with spring sowing :—

Variety	1922.	1923.	1924.	1925	1926.
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Reid	1 5	1 10	1 0	0 9	1 4
White Tartarian	1 12	1 10	1 0	0 13	Not sown.

Further tests are necessary to indicate whether Reid is actually superior to White Tartarian Both varieties have the same defects in suffering from frost and from loose smut, and in making a somewhat inferior quality of chaff, but they are fairly resistant to rust, and make an excellent growth with spring sowing, so excelling in these respects that practically no other varieties have yet arisen to challenge their superiority. Two varieties have, however, been recently evolved which have given sufficiently promising results in the stud plots to warrant putting them into field trials for comparison with Reid and White Tartarian. These are Birdwood and Walla (both Sunrise x Reid crosses).

Very Late Grain Oats (Spring Sown).

Practically the same remarks apply to very late grain oats for spring sowing as for very late hay oats. In a six-year test for grain. White Tartarian gave an average yield of 4 bushels per acre more than White Ligowo, and this, combined with its greater rust resistance, served to make it the standard variety of this class.

Reid, the variety selected from White Tartarian, appears in the stud plots to be a little better than its parent variety, and in field tests on the farm has given the following yields in comparison :—

Variety.	1922.	1923.	1924.	1925.	1926.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Reid	34 4	19 17	12 21	34 16	37 10
White Tartarian	37 8	15 10	8 3	40 29	Not sown.

Further tests are required with these varieties and Birdwood and Walla are also now available for inclusion.

Spring-sown oats are rather susceptible to loose smut and some definite improvement is required with such varieties in this respect. Markton, a variety from the United States of America, is reputed to be resistant, and if the present inoculation tests confirm this, it will be a useful oat for crossing to convey its resistant qualities, not being a desirable oat for direct use.

White Tartarian and Reid have, unfortunately, been found to be susceptible to one physiologic form of stem rust to which some strains of Richland are resistant, and crossing of these varieties is to be carried out in the hope of evolving a totally resistant variety.

It will be seen that, popular though White Tartarian is, it still has so many defects that there is a definite field for its improvement, in which much success is hoped for.

Late Hay Oats (Autumn Sown).

Varieties of the side-bearing type of oats, such as White Tartarian and Reid, are generally reckoned to be so susceptible to frost that they are not so well suited to autumn sowing. In these tableland districts an autumn-sown oat must be also a good grazing oat, must stool well and make quick recovery after grazing, and also must make good growth during cold weather. Algerian is a standard variety which has stood the test of comparison for a number of years, and which it will take a very good variety to replace for its suitability for autumn sowing.

Kherson, an American variety, was one of the first to be tested against Algerian at Glen Innes. It gave fair promise in the stud plots, but during nine years' field testing at the farm Algerian gave an average increased yield of 2 cwt. hay per acre. Kherson was discarded in 1920.

Though not a late variety, Ruakura came with a great reputation from New Zealand, but when tested over a period of seven years, Algerian proved better on the average by 2 cwt. hay per acre, and Ruakura was also discarded in 1920. Two promising selections from Ruakura (Kendall and Kurri) have, however, been made, and though not as late-maturing as Algerian, they may be worth testing against it for autumn sowing.

Over a period of five years Lachlan (White Ligowo x Algerian) has been tested against Algerian, and has about equalled it in yield of hay, but it is not quite as rust-resistant as Algerian, and has been discarded on this account.

The following table of yields in field tests at Glen Innes Farm since 1918. indicates how Algerian has maintained its position as the standard late variety for autumn sowing :—

FIELD Tests of Late Hay Oats (Autumn Sown).

Variety.	1918.	1919.	1920.	1922.	1923.	1924.	1925.	1926	1927.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Yarran	0 11	1 7	2 16	...	...	...	...	...	...
Boree	...	...	...	0 12	0 15	...	..	...	...
Smyrna	1 0	1 4	3 11	1 3	...	1 14	..	...	...
Fulghum (M.)	...	...	2 9	1 4	...	1 13	..	...	...
Quandong	...	...	2 5	1 3	1 18	1 4	...	..	...
Glen Innes No. 1. ...	0 9	1 6	3 4	1 1	...	1 16	1 2	...	...
Sixty Day	...	...	2 7	0 18	2 0	1 18	1 3	...	...
Bindo	...	...	...	0 18	2 0	1 16	1 2	...	.
Glen Innes No. 4 ...	...	...	...	...	...	...	...	1 3	...
Kurri (M.)	...	...	...	...	...	...	...	1 2	...
Budgery	...	...	...	...	...	...	...	...	0 19
Belar (M.)	...	...	...	1 0	...	1 15	1 5	1 3	0 19
Guyra (M.)	0 11	1 4	3 14	...	...	1 17	1 7	1 1	0 19
Algerian	0 12	1 6	3 4	1 3	2 3	1 19	1 5	1 0	1 0

M—Mid-season maturity

Yarran and Boree were quickly found unsuitable. Smyrna compared fairly favourably with Algerian in yield of hay. It has fine straw and stands up well, with long brown grain, which is held firmly. Its greater susceptibility to rust caused it to be discarded. Its other good qualities may, however, make it useful for crossing, though it is a poor grain yielder by comparison with Algerian.

Fulghum, a variety from the United States of America, was also discarded for its too great susceptibility to rust, but its good qualities, such as earliness, good stooling and strong straw with a desirable dark brown grain, have made it worth while using for further crossing and selection. The varieties Kelvin and Kareela have been selected from it.

Quandong (a selection from Ruakura) has been discarded on account of its sparse stooling and weakness of straw. Glen Innes No. 1 (White Ligowo x Algerian) resembles Algerian and yields fairly well, but cannot be said to be any improvement on it. Sixty Day (a variety from U.S.A.) is a useful dual-purpose variety, but has not proved equal to Algerian.

Bindo (Red Rustproof x Big Four) is identical with Wilga, and was rejected for low yields and coarse straw. Glen Innes No. 4 (White Ligowo x Algerian) stools well, and has fine and strong straw. It is worth further testing. Kurri and Budgery also require further testing.

After several years' trial, Belar (selection from Sunrise) does not appear to quite come up to Algerian in this group. Although earlier, Guyra (White Ligowo x Algerian) appears to compare very favourably with Algerian. It has medium straw, and also yields well for grain, having a very attractive, plump, brown grain. The awn is inclined to be a little on the strong side, but is easily removed in threshing.

The following varieties, in addition to those indicated, are, from observations in the stud plots, worth inclusion in field tests in autumn sowing against the standard variety, Algerian: Boppy, Lampton, Bombo.

Late Grain Oats (Autumn Sown).

The standard in this group is Algerian. Of those varieties not discarded from the stud rows in the hay section, the following have been submitted to field trials on the farm in recent years, and have yielded as indicated:—

Variety.	1925.	1926.	1927.
	bus lb.	bus. lb.	bus. lb.
Glen Innes No. 4 ...	27 2	33 30	......
Belar	15 9	34 29	9 25
Guyra	.....	32 28	9 7
Algerian	18 21	30 6	......
Algerian 3579	20 1	....	11 10

Algerian 3579 is the result of a cross between Algerian and Red Rust Proof, which is indistinguishable in appearance from Algerian, and it has been deemed unnecessary, therefore, to change the name. As it is somewhat more rust-resistant than the old Algerian, and a heavier yielder, both of grain and hay, it has been decided to discard the old Algerian in favour of this one. The varieties previously indicated as being worth testing for hay against Algerian for autumn sowing, should be included for grain trials.

Mid-season to Early Hay Oats (Winter Sown).

To be suitable for winter sowing in these tableland districts, a variety should make quick early growth during cold weather, and must also be rather resistant to stem rust, more especially when the crop is grown for grain (as all hay varieties necessarily must be), for this rust makes rapid headway on susceptible varieties in this climate in the later stages of growth of the crop. Guyra has answered these requirements for an oat in this class better than all other varieties so far, and is accepted as the standard for winter sowing.

The following table shows the hay yields of varieties which have been suggested for winter-sown field trials at Glen Innes Farm in recent years:—

FIELD Tests of Oats for Hay (Winter Sown).

Variety.	1922.	1923.	1924.	1925.	1926.	1927.
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Mulga (E.) ...	1 9	1 13	1 2	0 12	..	......
Gidgee (E.) ...	......	.....	.....	0 15	.....	......
Sunrise (E.) ...	......	......	1 0	1 1	1 4	1 13
Belar (M.) ...	.....	......	......	......	1 4	2 1
Kurri (M.) ...	......	......	......	......	1 2	1 17
Buddah (E.) ...	......	.....	......	.....	......	1 9
Guyra (M.) ...	1 8	2 1	1 6	0 16	1 1	1 19

E—Early maturing. M—Mid-season maturing.

Both Mulga and Gidgee have been discarded on account of their relatively greater susceptibility to stem rust. Sunrise compares fairly well with Guyra in yield and rust-resistance, but does not make as good quality hay, being much coarser in the stem.

The other varieties mentioned have not yet been tested under field conditions sufficiently long to indicate their relative value, but the present position can be seen quite clearly, viz., that there is nothing yet in sight to seriously challenge the supremacy of Guyra in this district as a winter-sown oat of this class. The following additional varieties, however, are suggested for inclusion in these field trials in comparison with Guyra :—

Midseason-maturing varieties—Kanota, Kareela, Kendall.

Early-maturing varieties—Kelvin, Kiah, Myall, Advocate.

Mid-season to Early Grain Oats (Winter Sown).

The standard in this group is Guyra also. The following table shows how the varieties which are still under field tests compare with Guyra in grain yield :—

Variety.	1924.	1925.	1926.	1927.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Sunrise (E.)	6 8	28 26	23 20	20 20
Belar (M.)	......	......	24 0	29 0
Kurri (M.)	......	......	27 20	25 35
Buddah (E.) ...	......	......	......	15 25
Guyra (M.)	6 39	22 7	29 10	24 20

E—Early maturing. M—Mid-season maturing.

The varieties previously suggested for inclusion in field hay trials against Guyra also stand for similar grain trials.

WHEATS.

Very Early to Early Wheat for Grain (Spring Sown).

When oaten chaff prices are low, farmers in the New England district frequently turn to early wheats for grain, wheat being the only alternative cereal crop which can be successfully grown after maize. This means a spring sowing, and only very early to early varieties which withstand rust largely, are successful.

Florence was for some time the most popular variety in this class, but it has now been supplanted by Clarendon, and no other variety as yet appears likely to challenge this, chiefly because there is no very early variety so resistant to rust, which takes a heavy toll of the grain yield in some years. A grain variety in this district must also hold its grain well, since with the climatic vagaries in midsummer sometimes delaying the harvest, any varieties which have a tendency to shatter lose yield from this cause.

The following are the yields from variety trials at Glen Innes Farm of spring-sown wheats of this class :—

Variety.	1923.		1924.		1925.		1926.		1927.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Early Bird	7	33	11	23	15	33	23	15	......	
Gresley	......		9	36	21	9	27	0	......	
Thew	......		15	37	21	43	20	0	......	
Riverina	18	22	9	55	27	22	......		9	45
Florence	17	43	14	23	15	35	16	40	11	45
Clarendon	16	44	9	19	26	8	27	50	19	44
Aussie	......		......		......		......		19	15
Duri	......		......		......		......		19	10
Canberra	......		......		......		......		16	0
Bobin	......		......		......		......		12	50

Early Bird, Gresley and Thew have been dropped because of their inferiority to Clarendon in yield or rust-resistance. On five years' test, Florence is an average of nearly 5 bushels per acre behind Clarendon, which indicates clearly the reason for Clarendon supplanting this variety. Some of the other varieties may be worth further trial, but none appear to resist rust like Clarendon.

Euston, a variety specially bred by Mr. Waterhouse, of Sydney University, from a cross between Thew and Canberra, each of which is resistant to a particular physiologic form of stem rust, is worth inclusion in this trial. Other varieties in this class which are also worth trial here are Silver Baart and Ainslie. Silver Baart is a South Australian production, while Ainslie is a recently-fixed Departmental cross.

Very Early to Early Hay Wheats.

Clarendon is the standard in this group also. Hay wheats are not very important in the New England district, as wheat cannot compete with oats for hay there. If any wheat is cut for hay in this district, it chiefly consists of sowings of varieties for grain, which do not during the season appear to be worth allowing to make a grain crop. Under these circumstances, hay trials of very early to early wheats, although conducted at the farm, are of little value. Of the apparently good grain yielding varieties of this class, Clarendon yields well enough by comparison for hay.

Late to very Late Grain Wheats.

This group is not of nearly equal importance in this district to wheats of the very early to early class which can be sown in spring after maize. Where wheats of the very late class are sown, they must be planted in autumn or winter. Genoa has long held the field as the standard variety for judging the value of others in this group, and nothing yet appears in sight to oust it from this position, except perhaps Barwang.

The following are the yields obtained from variety trials on the farm of autumn-sown wheats for grain which have been suggested for field testing in recent years :—

GRAIN Yields of Late to Very Late Wheats.

Variety.	1921.		1923.		1924.		1925.		1926.		1927.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Cleveland ...	10	0	16	30	6	50	25	47	7	50	28	0
Jindera	13	30	11	13	11	23	16	22	8	10	26	10
Genoa	12	0	15	41	24	52	21	43	10	0	19	30
Wandilla ...	......		14	6	4	2	16	25	12	45	......	
Yandilla King ...	......		15	51	11	46	......		9	15	......	
Canimbla... ..	......		......		12	16	19	38	8	50	......	
Barwang ...	......		......		23	18	25	32	13	10	25	35
Cadia	......		......		6	7	15	7	......		23	10
Comara	......		......		......		17	5	......		24	35
Cargo	......		......		......		......		......		25	35

Cleveland appears to do well in some years, but is not sufficiently consistent by comparison with Genoa It is, however, better than Genoa out on the North-western Slopes, where the climate is a little warmer than Glen Innes, but still not too hot and dry.

It was hoped that Jindera would prove a better variety than Genoa, but on six years' tests the latter averaged 3 bushels per acre better. Wandilla, Yandilla King, and Canimbla fall short, because of insufficient rust resistance, which affects their yields by comparison with Genoa.

Barwang is the only hope on the horizon at present that a superior variety has been evolved. It is much earlier than Genoa, and, so far, compares very favourably indeed with it, beating it for yield in the last three years out of four. Other varieties observed to be doing sufficiently well in the stud plots to be worth inclusion for field testing in this class are Alcorn (Genoa x Sussex) and Bombard (selection from Cowra No. 3).

Late to very Late Hay Wheats.

Similar remarks to those made under early hay wheats also apply here. Although field trials of hay wheats of this class are made at Glen Innes Farm, they are of little value. In any case, Genoa and Barwang have been found to be the best vaiieties of all the previously-mentioned late grain wheats.

OATS ON THE WHEAT FARM.

A FEATURE of last year's operations was the marked interest shown by farmers in oats. For many years little attention was given to this crop, but continuous wheat growing has brought forward problems in regard to disease control and soil fertility, and the growing of oats for fodder purposes seems to offer the best solution. The fertility of the land is maintained, wheat yields are improved, and the stock-carrying capacity of the farm is increased by the adoption of such a practice.—A. H. E. MCDONALD, Director of Agriculture.

Wheats Entered for the Royal Agricultural Society's Show, 1928.

MILLING TESTS AND AWARDS.

G. W. NORRIS, Chemist's Branch.

THE wheat exhibited in the Farrer Court at the Royal Agricultural Society's Show this year was drawn from all the principal wheat-growing States in the Commonwealth. Never before have entries been received from such a wide area in any one season, and the Royal Agricultural Society has every reason to be gratified with the support accorded it by the wheat-growers throughout Australia.

The two additional classes—Commonwealth Championships—attracted a large number of entries, especially in the medium-strong white wheat class. Every exhibit in these classes was milled, irrespective of the loss in points for appearance of grain and weight per bushel. An interesting feature of the championship cups awarded in this section this year is that each cup has an engraving on it of the late William Farrer, the Royal Agricultural Society considering this to be an appropriate recognition of Australia's great benefactor.

The entries this year totalled almost 200, as compared with 117 in 1927. The two Australian Championship classes attracted over fifty entries, twenty-five of which came from Western Australia and twenty from New South Wales. The Royal Agricultural Society's Championship Field Wheat Competition class had also about fifty entries.

The prize-money amounted to £183 in cash prizes, and two cups for Commonwealth Championship classes. These two trophies were valued at £25 each, bringing the total value of the awards up to £233. In 1927 the prize-money was less than £200.

After careful inspection to eliminate inferior exhibits, those which were considered eligible for prizes were milled, and the awards finally made in accordance with their actual behaviour in the mill and on results of flour tests, points being assigned for the different characteristics.

The results of these tests are given in the following table:—

RESULTS OF MILLING AND FLOUR TESTS.

Catalogue No.	Appearance of Grain.	Weight per bushel.		Ease of Milling.	Percentage of Flour.		Colour of Flour.	Percentage of Gluten.		Strength.		Total Pts.
Max. Points.	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	—
	10	15		10	10		15	20		20		100
					Class 1280 (Strong Flour, Red).							
7172	9	12½	65½	8	10	75	12	19	15·0	14½	49·6	85
7174	10	14½	67½	8	10	74·1	12	19	15·0	13	48·0	86½
7175	10	13½	66½	8	10	73·7	13	17½	13·4	17	52·0	89
7176	10	13½	66½	8	10	73·6	12	19½	15·7	16	51·0	89

Results of Milling and Flour Tests—*continued.*

Catalogue No.	Appearance of Grain.	Weight per bushel.		Ease of Milling.	Percentage of Flour.		Colour of Flour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	—
Max. Points.	10	15		10	10		15	20		20		100
Class 1281 (Commonwealth Champion Prize [Special]—Strong White Wheat).												
7178	9	14	67¼	8	10	75·2	13	17½	13·6	20	55·0	91½
7179	10	12½	65¾	8	10	74·8	12	20	15·9	19	54·0	91½
7180	9	14	67	8	9	73·1	13	15	11·4	19	54·0	87
7181	7	9½	62¾	10	8	72·2	13	13½	9·6	13	48·0	74
7182	10	14½	67¾	10	10	75·4	12	14½	10·6	15	50·0	86
7183	9	13½	66½	10	9	73·3	13	14	10·1	16	51·0	84½
7184	8	13½	66¾	10	10	75·0	12	15	10·9	16	51·0	84½
7185	9	13	66¼	8	8½	72·5	12	16	12·1	17	52·0	83½
7186	8	10½	63¾	10	9	73·2	14	15½	11·7	14	49·0	85
7187	8	12	65¼	10	9	73·4	12	18	14·0	15	50·0	84
7188	10	13½	66½	8	10	75½	14	20	16·5	17	52·4	92½
7189	9	14½	67½	8	10	74·0	13	15	11·1	20	55·5	89½
7191	8	12½	65½	10	9	73·0	13	13½	9·7	15	50·0	81
7192	10	13	66	10	10	74·0	14	18½	14·6	12½	47·6	88
Class 1282 (Commonwealth Champion Prize [Special]—Medium Strong White Wheat).												
7193	7	10	63¼	10	10	74·1	13	18	14·1	11	45·8	79
7194	8	10	63	10	10	74·8	11	13	8·7	13½	48·6	76½
7195	8	12	65	10	10	74·4	12	13½	9·6	10	45·0	75½
7196	8	9½	64½	10	9	72·8	11	15	11·1	10½	45·4	73
7197	9	14	67¼	10	10	75·0	12	15	10·83	15½	50·6	85½
7198	8	12	65¼	10	10	73·8	13	14	14·3	12	47·0	79
7199	10	10½	63¾	10	10	75·1	15	16	11·89	8½	43·6	80
7200	7	11	64	10	9½	73·6	13	14	10·0	10	45·0	74½
7201	8	10½	63½	10	10	75·5	15	15	11·2	12	47·2	80½
7202	8	11½	64½	10	10	74·2	14	12½	8·4	12	47·0	78
7203	8	11½	64·3	10	8	72·0	12	10	6·2	12	47·0	71½
7204	7	9	62¼	10	10	73·8	10	8½	4·4	9	44·0	63½
7205	8	11	64¼	10	10	75·4	15	15	11·2	13	48·0	82
7206	8	10½	63¾	10	10	76·0	12	17	13·0	10	45·2	77½
7207	8	11	64	10	10	74·0	14	14½	10·6	9	44·2	76½
7208	8	11	64	10	10	75·0	15	14	10·3	11	46·0	79
7209	8	11	64	10	10	74·2	12	14½	10·6	10	45·0	75½
7210	10	12½	65¾	10	9½	73·4	12	12½	8·6	10	45·0	76½
7211	8	11	64¼	10	10	73·8	14	13½	9·7	12	47·0	78½
7212	8	12	65	10	7½	71·5	11	12½	8·4	11	46·0	72
7213	8	8½	61¾	10	10	74·2	12	16½	12·8	11	46·0	76
7214	9	10½	63¾	10	10	74·5	13	15	11·1	11	45·8	78½
7215	9	11	64¼	10	10	75·0	13	8½	5·0	9	4·4	70½
7216	9	11½	64½	10	8	72·1	15	15	11·0	12	46·8	80½
7217	8	12	65	10	9	72·7	14	17½	13·5	9½	44·6	80
7218	9	11	64	10	10	74·3	14	15	11·2	11½	46·4	80½
7219	10	13½	66½	10	10	73·7	14	16	11·7	8½	43·2	82
7220	9	11½	64¾	10	9	73·4	13	18	14·3	12	46·8	82½
7221	9	12	65¼	10	10	74 3	15	15½	11·5	12	47·2	83½
7222	10	12½	66¾	10	8½	74·1	15	15	9·0	7	48·0	78
7223	9	11	64	10	10	75·2	15	13	9·2	11½	46·4	79½
7224	10	13½	66¾	10	10	74·1	13	13	9·0	13	48·0	82½
7225	9	11½	64¾	10	10	74·6	14	8½	4·4	11	46·0	74
7226	8	12½	65½	10	10	74·5	14	18	13·8	10½	45·6	83
7227	10	13½	66½	10	10	75·0	14	18	14·0	15	50·0	90½
7228	8	12	65¼	10	10	75·0	10	12½	8·4	13	48·0	75½
7229	9	11	64¼	10	10	74·0	11	11½	7·4	11	46·0	73½
7230	9	11	64¼	10	10	74·1	14	16½	12·5	11	46·0	81½
7231	9	14	67¼	10	9	73·1	11	17	13·2	10½	45·4	80½

Results of Milling and Flour Tests—*continued.*

Catalogue No.	Appearance of Grain.	Weight per bushel. Points.	Weight per bushel. Actual Weight.	Ease of Milling.	Percentage of Flour. Points.	Percentage of Flour. Actual per cent.	Colour of Flour.	Percentage of Gluten. Points.	Percentage of Gluten. Actual per cent.	Strength. Points.	Strength. Water Absorption.	Total Pts.
Max. Points.	10	15		10	10		15	20		20		100
Class 1283 (Florence) [Special].												
7232	8	13½	66½	10	10	74·9	12	17½	13·44	10½	45·6	81½
7233	10	13½	66½	10	10	74·0	14	20	16·0	8½	43·4	86
Class 1284 (Canberra) [Special].												
7234	10	14	67	10	10	74·4	15	17½	13·4	7½	42·4	84
7239	10	13	65¾	10	10	74·1	15	17½	13·2	8	42·8	83½
7240	10	13½	66½	10	10	73·7	14	16	11·7	8½	43·2	82
Class 1285 (Waratah) [Special].												
7244	9	12	65	10	8½	72·5	15	17	13·07	9½	44·6	81
7247	10	11	64¼	10	10	70·4	10	13	11·87	7½	42·6	71½
7252	9	14	67	10	10	75·7	11	12½	8·5	9	44·0	75½
7254	9	13	65¾	10	8	72·2	13	18	14·1	9	44·0	80
7256	10	13	66	10	10	75·2	14	17	13·0	7	42·0	81
Class 1286 (Wandilla) [Special].												
7257	10	13	65¾	10	10	73·9	14	16	12·1	7½	42·6	80½
7261	8	12½	65¼	10	8½	72·6	13	17½	13·4	9	43·8	78½
Class 1287 (Bena) [Special].												
7263	10	10½	63¾	10	10	75·1	15	16	11·9	7½	42·6	79
7264	10	13	65¾	10	9½	73·5	15	18	13·7	8	43·0	83½
7266	9	12	65	10	10	74·4	14	18½	14·3	7	42·0	80½
7268	9	11½	64½	10	8½	72·5	12	14	9·8	8	43·0	73
Class 1288 (Federation) [Novice].												
7272	10	11½	64½	10	7½	71·3	14	14½	10·6	7½	42·4	75
7274	10	13	65¾	10	10	74·4	9	10	6·7	7½	42·6	69½
Class 1289 (Federation) [Open].												
7280	10	11½	64½	10	7½	71·3	14	14½	10·6	7½	42·4	75
7281	10	12½	65¾	10	10	74·3	12	14½	10·4	7½	42·4	76½
7286	10	12½	65¼	10	8½	72·5	10	13½	9·5	9	43·8	73½
Class 1290 (Hard Federation).												
7288	9	12½	65½	10	8	72·1	14	16½	12·3	11½	46·6	81½
7291	9	12½	65½	10	8	71·7	13	17	13·1	10	45·0	79½
7292	10	12½	65¼	10	10	75·0	13	18½	14·4	11	46·0	85
7293	10	11½	64¼	10	10	74·0	15	16½	12·6	10	45·0	83
Class 1291 (Weak Flour).												
7297	9	12	65	10	8½	72·5	15	17	13·0	9½	44·6	81
7300	10	11	64	10	9	73·1	11	14½	10·4	9	44·0	74½
7301	10	12	65	10	8	72·0	10	12½	8·5	8	43·0	70½
7304	10	11	64¼	10	10	74·4	10	13	11·8	7½	42·6	71½
7310	10	13½	66½	10	10	74·0	12	19½	15·3	8½	43·4	83½
7312	10	12½	65½	10	10	74·2	10	14½	10·4	7	42·0	74
7315	9	13	65¾	10	8	72·2	13	18	14·1	9	44·0	80
7316	10	13	66	10	10	74·3	10	16½	12·8	7	42·0	76½

Results of Milling and Flour Tests—*continued.*

Catalogue No.	Appearance of Grain.	Weight per bushel. Points.	Weight per bushel. Actual Weight.	Ease of Milling.	Percentage of Flour. Points.	Percentage of Flour. Actual per cent.	Colour of Flour	Percentage of Gluten. Points.	Percentage of Gluten. Actual per cent.	Strength. Points.	Strength. Water Absorption.	Total Pts.
Max. Points.	10	15		10	10		15	20		20		100
Class 1295 (Medium Strong) [Special].												
7323A	10	11	63¾	10	10	74·3	14	14	9·9	8½	43·6	77½
7325	9	11½	64½	10	9½	73·6	11	15	10·7	9½	44·4	75½
7327	10	12½	65¼	10	8½	72·5	14	18½	14·7	8½	43·2	82
7329	10	10½	63¾	10	10	75·1	15	16	11·9	8½	43·6	80
7336	10	12½	65½	10	8½	72·6	15	15	10·8	7	42·0	78
7339	9	10½	63½	10	10	73·8	14	17	12·8	7½	42·2	78
Class 1296 (Weak Flour) [Special].												
7341	10	12½	65¼	10	10	74·6	12	13½	9·3	9	44·0	77
7342	9	11½	64½	10	8	72·1	15	16	11·8	9	44·2	78½
7347	8	12½	65¼	10	8	71·9	15	15½	11·5	9	44·0	78
7348	9	12	65	10	8½	72·5	15	17	13·1	9½	44·6	82
7351	9	10	62¾	10	9½	73·6	13	15½	11·4	10	45·0	77
7354	10	12½	65½	10	8½	72·4	15	17½	13·6	6	41·2	79½
7361	9	11½	64½	10	9½	73·4	14	16	11·7	7½	42·4	77½
7368	9	13	65¾	10	8	72·2	13	18	14·1	9	44·0	80

JUDGING OF WHEATS IN CLASSES WHICH WERE NOT SUBMITTED TO MILLING TEST.

Catalogue No.		[illegible] Variety.	Weight per bushel. Actual Weight.	Weight per bushel. Points.	Appearance of Grain.	Trueness to Type.	Uniformity of Grain.	Total.
		Maximum Point ...		15	10	10	10	45
Class 1292 (Collection of Five Farrer Wheats).								
7317	A.	Bena	65¾	12½	10	10	9	41½
	B.	Canberra ...	66½	13½	10	10	10	43½
	C.	Cedar	67½	14½	10	10	10	44½
	D.	Federation ...	66	13	10	10	10	43
	E.	Hard Federation	65½	12½	10	10	10	42½
								215
7318	A.	Bena	62	9	8	8	8	33
	B.	Canberra ...	63½	10½	8	9	8	35½
	C.	Hard Federation	62½	9½	9	9	9	36½
	D.	Union	63½	10½	9	9	9	37½
	E.	Waratah ...	59¾	7	8	8	8	31
								173½
7319	A.	Bobs	66¾	13½	10	10	10	43½
	B.	Cedar	65½	12½	9	9	9	39½
	C.	Comeback ...	66¾	13½	10	10	10	43½
	D.	Canberra ...	66½	13½	9	10	10	42½
	E.	Warren ...	66	13	10	10	10	43
								212

Judging of Wheats in Classes which were not Submitted to Milling Test— *continued.*

Catalogue No.		Variety.	Weight per bushel. Actual Weight.	Weight per bushel. Points	Appearance of Grain.	Trueness to Type.	Uniformity of Grain.	Total.
		Maximum Points ...		15	10	10	10	45
		Class 1293 (Collection of Five Non-Farrer Wheats).						
7320	A.	Bruce	65½	12½	9	9	10	40½
	B.	Petatz Surprise	67	14	9	10	10	43
	C.	Pusa No. 4 ...	65¾	12½	10	10	10	42½
	D.	Ranee	65¾	12½	9	10	10	41½
	E.	Wandilla ...	65¾	12½	9	10	10	41½
								209
7321	A.	Gresley	65	12	9	10	9	40
	B.	Major	65	12	9	10	10	41
	C.	Minister ...	65¼	12½	9	10	9	40½
	D.	Warden ...	65½	12½	10	10	10	42½
	E.	Yanward ...	65	12	9	10	9	40
								204
7322	A.	Carrabin ...	65¼	12	9	10	10	41
	B.	Minister ...	64½	11½	9	10	9	39½
	C.	Nabawa ...	64¾	11½	9	10	9	39½
	D.	Petatz Surprise	67½	14½	10	10	10	44½
	E.	Yandilla King ...	65¼	12	9	10	10	41
								205½

AWARDS.

Class 1280— Strong Red.
Prizes divided between No. 7175—G. S. Gillespie; Cedric variety; grown at Millmerran, Queensland, on light sandy loam; seed per acre, 60 lb.; yield per acre, 15 bushels; rainfall during growth, 5·11 inches; autumn ploughing; and No. 7176—S. J. Plowman; Cedar variety; grown at Parkes, New South Wales, on clayey loam; seed per acre, 58 lb.; yield per acre, 22½ bushels; rainfall during growth, 9·09 inches; fallow.

Class 1281— Strong White. Commonwealth Champion Prize.
S. Pollock (7188); Comeback variety; grown at Quirindi, New South Wales, on red soil; seed per acre, 45 lb.; yield per acre, 22 bushels; rainfall during growth, 8·35 inches.

Class 1282— Medium Strong. Commonwealth Champion Prize.
W. Tonkin (7227); Perfection variety; grown at Delungra, New South Wales, on heavy black soil; seed per acre, 45 lb.; yield per acre, 21 bushels; rainfall during growth, 3·72 inches; fallow.

Class 1283— Special, Florence.
1st (7233)—S. Pollock; grown at Quirindi, New South Wales, on red soil; seed per acre, 45 lb.; yield per acre, 22 bushels; rainfall during growth, 9·11 inches; autumn ploughing.
2nd (7232)—W. Dearling; grown at Oakey, Queensland, on chocolate loam; seed per acre, 60 lb.; yield per acre, 18 bushels; rainfall during growth, 9·11 inches; autumn ploughing.

Awards—*continued.*

Class 1284— Special, Canberra.	1st (7234)—J. W. Eade; grown at Euchareena, New South Wales, on chocolate loam; seed per acre, 60 lb.; yield per acre, 33 bushels; no record of rainfall; fallow. 2nd (7239)—S. J. Plowman; grown at Parkes, New South Wales, on clayey loam; seed per acre, 58 lb.; yield per acre, 28½ bushels.
Class 1285— Special, Waratah.	Prizes divided between Nos. 7244 and 7256. No. 7244—W. J. Coddington and Sons; grown at Murrumburrah, New South Wales, on red loam; seed per acre, 65 lb; yield per acre, 40 bushels; rainfall during growth, 10·12 inches; fallow. No. 7256—W. Tonkin; grown at Delungra, New South Wales, on brown soil; seed per acre, 45 lb.; yield per acre, 24 bushels; rainfall during growth, 4·52 inches; summer fallow.
Class 1286— Special, Wandilla.	1st (7257)—Mrs. J. Berney; grown at Eurimbla, New South Wales, on light loam; seed per acre, 60 lb.; yield per acre, 23 bushels; rainfall during growth, 5 inches; fallow. 2nd (7261)—S. Pollock; grown at Qurindi, New South Wales, on red soil; seed per acre, 45 lb.; yield per acre, 24 bushels; rainfall during growth, 8·35 inches; short fallow.
Class 1287— Special, Bena.	1st (7264)—J. W. Eade; grown at Euchareena, New South Wales, on chocolate loam; seed per acre, 35 lb.; yield per acre, 36 bushels; no record of rainfall; fallow. 2nd (7266)—S. Pollock; grown at Quirindi, New South Wales, on black soil; seed per acre, 45 lb.; yield per acre, 41 bushels; rainfall during growth, 8·35 inches, short fallow.
Class 1288— Special, Federation (Novice).	1st (7272)—E. W. Dahlenburg; grown at Salisbury, Victoria, on sandy loam; seed per acre, 72 lb.; yield per acre, 21 bushels; rainfall during growth, 7·04 inches; spring fallow. 2nd (7274)—G. J. Glatz; grown at Dimboola, New South Wales, on red Mallee loam; seed per acre, 80 lb.; yield per acre, 20 bushels; rainfall during growth, 9·15 inches; fallow.
Class 1289— Special, Federation (Open).	1st (7281)—J. W. Eade; grown at Euchareena, New South Wales, on chocolate loam; seed per acre, 45 lb; yield per acre, 33 bushels; no record of rainfall; fallow. 2nd (7280)—E. W. Dahlenburg; grown at Salisbury, Victoria, on sandy loam; seed per acre, 72 lb.; yield per acre, 21 bushels; rainfall during growth, 7·04 inches; spring fallow.
Class 1290— Special, Federation Hard.	1st (7292)—S. Pollock; grown at Quirindi, New South Wales, on red soil; seed per acre, 45 lb.; yield per acre, 33 bushels; rainfall during growth, 8·35 inches; autumn ploughing. 2nd (7293)—F. C. Rowlands and Sons; grown at Cowra, New South Wales, on red loam; seed per acre, 60 lb.; yield per acre, 37 bushels; rainfall during growth, 10 inches; fallow.
Class 1291— Weak Flour.	1st (7310)—S. J. Plowman; Ford variety; grown at Parkes, New South Wales, on clayey loam; seed per acre, 58 lb.; yield per acre, 31 bushels; rainfall during growth, 9·00 inches; fallow. 2nd (7297)—W. J. Coddington and Sons; Waratah variety; grown at Murrumburrah, New South Wales, on light chocolate loam; seed per acre, 65 lb.; yield per acre, 40 bushels; rainfall during growth, 10·12 inches; fallow.

Awards—*continued.*

Class 1292— Collection of Five Farrer Wheats.	1st (7317)—J. W. Eade; varieties—Bena, Canberra, Cedar, Federation and Hard Federation; grown at Euchareena, New South Wales, on chocolate loam; seed per acre, 45 lb. in case of Bena, Cedar, Federation and Hard Federation, and 60 lb. in case of Canberra; yields per acre—Bena and Hard Federation, 36 bushels, Canberra and Federation, 33 bushels, Cedar, 24 bushels; fallow. 2nd (7319)—S. Pollock; varieties—Bobs, Canberra, Cedar, Comeback, Warren; grown at Quirindi, New South Wales; Bobs, Canberra, and Warren on black soil; Cedar and Comeback on red soil; seed per acre—Bobs, Cedar, Comeback and Warren, 45 lb.; Canberra, 58 lb.; yields per acre—Bobs, 24, Cedar, 19, Canberra, 38, Comeback, 22, and Warren 21 bushels; rainfall during growth, 8·35 inches; Canberra on short fallow; Bobs, Cedar, Comeback and Warren, autumn ploughing.
Class 1293— Collection of Five Non-Farrer Wheats.	1st (7320)—Mrs. J. Berney; varieties—Bruce, Petatz Surprise, Pusa No. 4, Ranee, Wandilla; grown at Eurimbla, New South Wales; Bruce and Rance on strong loam, Petatz Surprise and Wandilla on light loam, Pusa No. 4 on red loam; seed per acre—Bruce, 65 lb., Petatz Surprise, Pusa No. 4, Ranee, and Wandilla, 60 lb.; yields per acre—Bruce, 28, Petatz Surprise, 18, Pusa No. 4, 19, Ranee, 25, and Wandilla, 23 bushels; rainfall during the growth—Bruce, 5·5 inches, Petatz Surprise, 5·25 inches, Pusa No. 4 and Wandilla, 5 inches, Ranee, 5·4 inches; fallow. 2nd (7322)—S. Pollock; varieties—Carrabin, Minister, Nabawa, Petatz Surprise, Yandilla King; grown at Quirindi, New South Wales; Carrabin, Nabawa, Petatz Surprise and Yandilla King on black soil, Minister on red soil; seed per acre—Carrabin, Minister and Petatz Surprise, 45 lb.; Nabawa and Yandilla King, 58 lb.; yields per acre—Carrabin, 21, Petatz Surprise, 18, Yandilla King and Nabawa, 36, and Minister, 28 bushels; rainfall during growth—Nabawa, Minister, Carrabin and Petatz Surprise, 8·35 inches, Yandilla King, 9·11 inches; autumn ploughing.
Class 1294— Strong White. Society's Field Championship.	1st (7323)—Mrs. J. Berney; Comeback variety; grown at Eurimbla, New South Wales, on gray soil; seed per acre, 60 lb.; yield per acre, 22 bushels; rainfall during growth, 5·25 inches; fallow.
Class 1295— Medium Strong. Society's Field Championship.	1st (7327)—J. Cavanagh; Clarendon variety; grown at Curlewis, New South Wales, on chocolate loam; seed per acre, 40 lb.; yield per acre, 30 bushels; rainfall during growth, 1·67 inches; fallow. 2nd (7329)—W. J. Coddington and Sons; Bena variety; grown at Murrumburrah, New South Wales, on red loam; seed per acre, 65 lb.; yield per acre, 40 bushels; rainfall during growth, 10·12 inches; fallow.
Class 1296— Weak Flour. Society's Field Championship.	1st (7349)—W. J. Coddington and Sons; Waratah variety; grown at Murrumburrah, New South Wales, on red loam; seed per acre, 65 lb.; yield per acre, 40 bushels; rainfall during growth, 10·12 inches; fallow. 2nd (7368)—R. H. Thackeray; Waratah variety; grown at Young, New South Wales, on red loam; seed per acre, 65 lb.; yield per acre, 28 bushels; rainfall during growth, 11·09 inches; fallow.

RESULTS OF MILLING TESTS.

Lab. No	Variety.	Grown at—	Weight per bushel.	Percentage of Bran.	Percentage of Pollard.	Percentage of Flour.	Water Absorption.	Percentage dry gluten.
		Class 1280 (Strong Flour, Red.)						
(1)	Cedar	Eurimbla, N.S.W. ...	65½	9·7	15·2	75·0	49·6	15·0
(3)	,, ...	Euchareena, N.S.W. ...	67½	10·9	14·9	74·1	48·0	15·0
(3A)	Cedric	Millmerran, Q'ld.... ...	66½	13·8	12·4	73·7	52·0	13·4
(4)	Cedar	Parkes, N.S.W.	66½	11·9	14·5	73·6	51·0	15·7
		Class 1281 (Commonwealth Champion Prize—Strong White).						
(147)	Minister ...	Warre Warral, N.S.W. ...	62¾	13·9	13·7	72·2	48·0	9·6
(152)	,, ...	Caniambo, Vic.	63¾	13·4	13·4	73·2	49·0	11·7
(153)	,, ...	Toolamba, Vic.	65¼	13·0	13·5	73·4	50·0	14·0
(148)	,, ...	Dimboola, N.S.W. ...	67¾	12·5	12·0	75·4	50·0	10·6
(149)	Carrabin ...	Belka, W.A.	66½	12·6	14·0	73·3	51·0	10·1
(151)	,, ...	Three Springs, W.A. ...	66¾	12·3	12·6	75·0	51·0	10·9
(157)	,, ...	Koorda, W.A.	65½	11·8	15·1	73·0	50·0	9·7
(158)	Quality ...	Delungra, N.S.W. ...	66	12·0	13·9	74·0	47·6	14·6
(146)	Comeback ...	Noggojerring, W.A. ...	67	12·5	14·3	73·1	54·0	11·4
(150)	,, ...	Three Springs, W.A. ...	66¼	14·5	13·0	72·5	52·0	12·0
(154)	,, ...	Quirindi, N.S.W. ...	66¼	11·5	12·9	75·5	52·4	16·5
(144A)	Pusa, No. 4 ...	Clifton, Queensland ...	67¼	11·8	12·9	75·2	55·0	13·6
(145)	,, ...	Eurimbla, N.S.W. ...	65¾	11·5	13·6	74·8	54·0	15·9
(155)	,, ...	Gilgandra, N.S.W. ...	67¼	11·5	14·5	74·0	55·0	11·2
		Class 1282 (Commonwealth Champion Prize—Medium Strong).						
(169)	Hard Federation	Corrigin, W.A.	64½	13·1	14·9	72·0	47·0	6·3
(193)	Perfection ...	Delungra, N.S.W. ...	66½	10·2	14·8	75·0	50·0	14·0
(163)	Florence ...	Southern Brook, W.A. ...	67¼	11·2	13·8	75·0	50·6	10·8
(196A)	Watchman ...	Warwick, Q'ld.	67¼	12·0	14·8	73·1	45·4	13·2
(186)	Warren... ...	Quirindi, N.S.W. ...	64¾	10·8	15·7	73·4	46·8	14·3
(194)	Baroota Wonder	Corrigin, W.A.	65¼	12·5	12·5	75·0	48·0	8·4
(178)	Meredin ...	Three Springs, W.A. ...	65	13·3	15·1	71·5	46·0	8·4
(188)	Nizam	Brocklesby, N.S.W. ...	65½	14·3	13·0	72·6	42·0	10·8
(161)	African Wonder	Corrigin, W.A.	63	10·0	15·1	74·8	48·6	8·7
(162)	Graham ...	Berrigan, N.S.W. ...	64¼	12·6	14·4	72·8	45·4	11·1
(164)	Clarendon ...	Three Springs, W.A. ...	65¼	11·2	14·8	73·8	47·0	14·3
(172)	Field Marshall...	Kilkerran, S.A.	63¾	12·0	12·0	76·0	45·2	12·9
(160)	Early Gluyas ...	Corrigin, W.A.	65	11·7	13·7	74·4	45·0	9·6
(166)	,, ...	Doodarding, Dowerin district, W.A.	64	12·1	14·2	73·6	45·0	10·0
(190)	Gresley... ...	Corrigin, W.A.	66¾	12·3	13·4	74·1	48·0	9·0
(187)	,, ...	Cowra, N.S.W.	65¼	12·6	12·8	74·3	47·2	11·5
(181)	,, ...	Caniambo, Vic.	64½	13·4	14·4	72·1	46·8	11·0
(159)	Yandilla King...	Cranbury, N.S.W. ...	63½	11·9	13·9	74·1	45·8	14·1
(170)	,, ,, ...	Corrigin, W.A.	62¼	12·0	14·0	73·8	44·0	4·4
(173)	,, ,, ...	Warre Warral, N.S.W. ...	64	10·8	14·9	74·2	45·0	10·6
(179)	,, ,, ...	Junee, N.S.W.	61¾	11·1	14·6	74·2	46·0	12·8
(174)	Canberra ...	Warre Warral, N.S.W. ...	64	13·0	13·0	74·0	44·2	10·6
(176)	,, ...	Kellerberrin, W.A. ...	65¾	12·2	14·3	73·4	45·0	8·6
(182)	,, ...	Trundle, N.S.W.	65	13·2	14·0	72·7	44·6	13·5
(185)	,, ...	Quirindi, N.S.W. ...	66½	14·1	12·1	73·7	43·2	11·7
(192)	,, ...	Young, N.S.W.	65½	10·8	14·6	74·5	45·6	13·8
(167)	Nabawa ...	Dowerin, W.A.	63½	10·7	13·7	75·5	47·2	11·2
(168)	,, ...	Corrigin, W. A.	64½	10·7	14·0	74·2	47·0	8·4
(171)	,, ...	Goomarin, W.A.	64¼	11·7	12·7	75·4	48·0	11·2
(175)	,, ...	Warre Warral, N.S.W. ...	64	11·7	13·2	75·0	46·0	10·3

Results of Milling Tests—*continued.*

Lab.No.	Variety.	Grown at—	Weight per bushel.	Percentage of Bran.	Percentage of Pollard.	Percentage of Flour.	Water Absorption.	Percentage dry gluten.
		Class 1282 (Commonwealth Champion Prize—Medium Strong)—*continued.*						
(177)	Nabawa ...	Belka, W.A.	64¼	14·3	11·7	73·8	47·0	9·7
(180)	,, ...	Minnivale, W.A.	63¾	12·2	13·2	74·5	45·8	11·1
(183)	,, ...	Coorow, W.A.	64	10·7	14·8	74·3	46·4	11·2
(184)	,, ...	Beverley, W.A.	64¼	9·8	15 3	74·9	44·0	5·0
(189)	,, ...	Kcorda, W.A.	64	12·1	12·6	75·2	46·4	9·2
(191)	,, ...	Corrigin, W.A.	64¾	13·2	12·1	74·6	46·0	4·4
(195)	,, ...	,, ...	64¼	10·8	15·1	74·0	46·0	7·4
(196)	,, ...	Berrigan, N.S.W. ...	64¼	11·6	14·2	74·1	46·0	12·5
		Class 1284 (Canberra).						
(7)	Canberra ...	Euchareena, N.S.W. ...	67	14·3	11·2	74·4	42·4	13·4
(12)	,, ...	Parkes, N.S.W.	65¾	14·7	11·1	74·1	42·8	13·2
(13)	,, ...	Quirindi, N.S.W. ...	66½	14·1	12·1	73·7	43·2	11·7
		Class 1285 (Waratah).						
(24)	Waratah ...	Quirindi, N.S.W. ...	67	12·2	12·0	75·7	44·0	8·5
(26)	,, ...	St. Arnaud, Vic.	65¾	12·2	15·4	72·2	44·0	14·1
(28)	,, ...	Delungra, N.S.W. ...	66	14·0	10·7	75·2	42·0	13·0
		Class 1286 (Wandilla).						
(29)	Wandilla ...	Eurimbla, N.S.W. ...	65¾	14·4	11·6	74 0	42·6	12·1
(33)	,, ...	Quirindi, N.S.W. ...	65¼	12·7	14·5	72·6	43·8	13·4
		Class 1287 (Bena).						
(36)	Bena	Euchareena, N.S.W. ...	65¾	11·1	15·4	73·5	43·0	13·7
(38)	,, ...	Quirindi, N.S.W. ...	65	12·2	13·3	74·4	42·0	14·3
(40)	,, ...	Cowra, N.S.W.	64½	12·2	15·3	72·5	43·0	9·7
		Class 1288 (Federation) [Novice].						
(44)	Federation ...	Salisbury, Vic.	64½	14·5	14 3	71·3	42·4	10·5
(46)	,, ...	Dimboola, N.S.W. ...	65¾	12·2	13·3	74·4	42·6	6·7
		Class 1289 (Federation) [Open].						
(52)	Federation ...	Salisbury, Vic.	64½	14·5	14·3	71·3	42·4	10·5
(53)	,, ...	Euchareena, N.S.W. ...	65¾	11·2	14·4	74·3	42·4	10·4
(58)	,, ...	Quirindi, N.S.W. .	65¼	13·6	13·9	72·5	43·8	9·4
		Class 1290 (Federation) [Hard].						
(60)	Hard Federation	Euchareena, N.S.W. ...	65½	12·0	15·8	72·1	46·6	12·3
(64)	,, ,, ...	Toolamba, Vic.	65½	12·6	15·6	71·7	45·0	13·1
(65)	,, ,, ...	Quirindi, N.S.W. ...	65¼	11·9	13·1	75·0	46·0	14·4
(66)	,, ,, ...	Cowra, N.S.W.	64¼	10·2	15·7	74·0	45·0	12·6
		Class 1291 (Weak Flour).						
(72)	Nabawa ...	Salisbury, Vic.	64	13·8	13·0	73·1	44·0	10·4
(73)	Nizam ...	,, ,, ...	65	15·0	13·0	72·0	43·0	8·5
(76)	Waratah ...	Shepparton, Vic. ...	64½	14·6	11·0	74·4	42·6	11·8
(81)	Ford	Parkes, N.S.W.	66½	12·1	13·7	74·0	43·4	15·3
(83)	Federation ...	Quirindi, N.S.W. ...	65½	13·4	12·3	74·2	42·0	10·4
(89)	Waratah ...	Delungra, N.S.W. ...	66	14·9	10·7	74·3	42·0	12·8

Results of Milling Tests—*continued.*

Lab.No.	Variety	Grown at—	Weight per bushel.	Percentage of Bran.	Percentage of Pollard.	Percentage of Flour.	Water Absorption.	Percentage dry gluten.
		Class 1295 (Medium Strong) [Special].						
(97)	Wandilla ...	Brocklesby, N.S.W. ...	63¾	12·1	13·5	74·3	43·6	10·0
(99)	Marshall's No. 3	Wallendbeen, N.S.W. ...	64¼	12·0	14·4	73·6	44·4	10·7
(101)	Clarendon ...	Curlewis, N.S.W. ...	65¼	14·7	12·7	72·5	43·2	14·7
(103)	Bena	Murrumburrah, N.S.W.	63¾	13·5	11·3	75·1	43·6	11·9
(109)	Nizam	Brocklesby, N.S.W. ...	65½	14·3	13·0	72·6	42·0	10·8
(112)	Nabawa ...	Berrigan, N.S.W. ...	63½	15·1	11·0	73·8	42·2	12·8
		Class 1296 (Weak Flour) [Special].						
(114)	Waratah ..	Eurimbla, N.S.W. ...	65¼	12·8	12·4	74·6	44·0	9·3
(115)	,, ...	Greenethorpe, N.S.W. ...	64½	13·8	14·0	72·1	44·2	11·8
(120)	,, ...	Boorowa, N.S.W. ...	65¼	14·5	13·6	71·9	44·0	11·5
(121)	,, ...	Murrumburrah, N.S.W. ...	65	14·3	13·1	72·5	44·6	13·0
(125)	Turvey ...	Lockhart, N.S.W. ...	62¾	13·0	13·3	73·6	45·0	11·4
(128)	Federation ...	Gunningbland, N.S.W. ...	65½	13·9	13·4	72·4	41·2	13·6
(133)	,, ...	Daysdale, N.S.W. ...	64½	13·4	13·1	73·4	42·4	11·7

General Comments on the Exhibits.

In general appearance the wheats submitted for this year's judging were equal to those of previous shows. Milling and flour tests, however, disclosed that water absorption—a very important factor—had fallen to an appreciable extent, while gluten-content was higher. It is practically impossible to separate them purely on appearance and weight per bushel, though tests revealed at once the more important differences. The increase in gluten content was found to be particularly marked in the red wheat Cedar, in Florence, and in a number of the softer wheats.

The red wheat class was poorly represented, but nevertheless the prizes had to be divided between Mr. G. S. Gillespie, of Millmerran, Queensland, and Mr. S. J. Plowman, of Parkes. The former exhibited Cedric, a new wheat to the Royal, while the latter placed his faith in Cedar. Both samples scored 89 points, a somewhat lower figure than is usual for a prize-winner in this class. The flour obtained in the mill from both these wheats had all the characteristics of a strong wheat—high water absorption, gluten-content, and of a dark cream colour. The Commonwealth Championship for strong white was won by S. Pollock, Quirindi, who has for years always been well up in the prize list. He has great faith in Comeback (Farrer's best strong white wheat), which scored a grand total of 92½ points, while two other exhibits of the Pusa variety each scored 89½ points. Comeback produced a very rich flour—it contained over 16 per cent. of dry gluten — while the colour was exceptionally good, and it was due to these two outstanding characteristics that it secured the prize.

The Commonwealth Championship for medium strong white wheat was won by Mr. W. Tonkin, another old and very successful New South Wales exhibitor, with the variety Perfection. His grand total was 90½ points, an easy victory, as the next best total was 85½ points, secured by Florence, exhibited by J. M. Carroll, Southern Brook, Western Australia.

The "Canberra Special" was keenly contested, all samples being bright uniform, and almost alike. Mr. J. W. Eade. of Euchareena, led Mr. S. J. Plowman, of Parkes, by the smallest possible margin of half a point, the former scoring 84 and the latter 83½ points. This is a very good milling wheat, yielding flour readily. The flour is of excellent colour, medium water-absorption, and gluten-content.

Like Canberra the "Waratah Special" attracted a good entry of very even samples. and it was necessary to divide the prizes between Messrs. W. J. Coddington and Sons and W. Tonkin, both scoring 81 points.

"Bena Special" is a large bold grain variety, and is perhaps not so shapely as most other varieties. Although not as heavy as other competitors, it is nevertheless plump. Mr. J. W. Eade scored an easy victory with 83½ points, while the second prize went to Mr. S. Pollock with 80½ points.

Some fine samples submitted in the Hard Federation section showed that this wheat still retains its high milling qualities, producing a flour of good water absorption, rich in gluten and of excellent colour. Honours in this class went to Mr. S. Pollock, who scored 85 points, followed closely by Messrs. F. C. Rowlands and Sons with 83 points.

In the Weak-flour Class 1291, Mr. S. J. Plowman took first prize with a sample of Ford. This is an excellent milling variety, producing over 74 per cent. of flour; it is very rich in gluten, of good colour, and of satisfactory water absorption. It secured a grand total of 83 points.

Of the many varieties submitted in the Special Weak Flour Class 1296, Waratah, which showed to such advantage in the last Field Wheat Championships, gained both first and second places. The winning sample entered by Messrs. W. J. Coddington and Sons secured a grand total of 82 points. The flour had an excellent colour, high gluten-content and satisfactory water-absorption. Second prize was awarded to Mr. R. H. Thackeray, of Young, whose entry scored 80 points.

Infectious Diseases Reported in October.

THE following outbreaks of the more important infectious diseases were reported during the month of October, 1928:—

Anthrax	3
Blackleg	7
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	27
Swine fever	Nil.
Contagious pneumonia	Nil

—MAX HENRY, Chief Veterinary Surgeon.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kinross Bros., Minnamurra, Inverell (Guernseys)	77	5 Dec., 1928
Lunacy Department, Morisset Mental Hosptial	16	8 ,, 1928
Department of Education, Eastwood Home	16	16 ,, 1928
J. Davies, Puen Buen, Scone (Jerseys)	36	16 ,, 1928
Lunacy Department, Rydalmere Mental Hospital	63	25 ,, 1928
Lunacy Department, Callan Park Mental Hospital	20	26 ,, 1928
Miss Brennan, Arrankamp, Bowral	24	29 ,, 1928
Mr. Stanton, Leicester Park, Mittagong	63	6 Jan., 1929
Department of Education, Yanco Agricultural High School	34	12 ,, 1929
New England Girls' Grammar School, Armidale	17	12 ,, 1929
A. E. Collins, Hazelhurst Dairy, Bowral	13	8 Feb., 1929
A. V. Chaffey, "Lilydale," Glen Innes	16	14 ,, 1929
Lunacy Department, Kenmore Mental Hospital	99	17 ,, 1929
Tudor House School, Moss Vale	6	22 ,, 1929
Lunacy Department, Orange Mental Hospital	3	22 ,, 1929
William Thompson Masonic School, Baulkham Hills	29	23 ,, 1929
Australian Missionary College, Cooranbong	57	24 ,, 1929
Department of Education, Hurlstone Agricultural High School	33	1 Mar., 1929
J. F. Chaffey, Glen Innes (Ayrshires)	58	2 May, 1929
F. W. Hopley, Leeton	25	14 ,, 1929
P. F. Mooney, Calala	33	16 ,, 1929
Department of Education, Gosford Farm Homes	16	16 ,, 1929
E. P. Perry, Nundorah, Parkville (Guernseys)	26	12 June, 1929
Dominican Convent, Moss Vale	4	26 ,, 1929
Sacred Heart Convent, Bowral	10	21 July, 1929
St. Patrick's College, Goulburn	8	26 ,, 1929
Presbyterian Ladies College, Goulburn	4	26 ,, 1929
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	9 Aug., 1929
Kyong School, Moss Vale	2	21 ,, 1929
Department of Education, Mittagong Farm Homes	29	23 ,, 1929
Blessed Chanel's Seminary, Mittagong	4	25 ,, 1929
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	75	25 ,, 1929
Walaroi College, Orange	5	30 ,, 1929
Riverstone Meat Co., Riverstone Meat Works, Riverstone	114	5 Sept., 1929
J. L. W. Barton, Wallerawang	22	11 Oct., 1929
King Bros., Hygienic Dairy Company, Casula, Liverpool	88	7 Nov., 1929

—MAX HENRY, Chief Veterinary Surgeon.

AGRICULTURAL PUBLICATIONS FOR THE ASKING.

BETWEEN 400 and 500 leaflets, varying in length from one to a dozen pages, and each written to supply just the information required on the many practical problems that confront the farmer, pastoralist, dairyman, orchardist, poultry-keeper, &c., are available for the asking. During the past twelve months about 104,000 of these leaflets were distributed to farmers in all parts of the State.

It is recognised that the information on the scientific, economical, and practical side of agriculture, which is being collected by Departmental officers per medium of research, field experiments, and laboratory work, is of little value unless it reaches the individual in whose interests the work is being done, *i.e.*, the man on the land. That is the mission of the Department's free publications. Write for a "List of Publications" to-day.

Chemical Control in the Butter Factory.

DETERMINATION OF THE MOISTURE AND SALT CONTENT OF BUTTER.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist.

IN order that New South Wales may, not only keep its position as a producer of butter, &c., but, if possible, get ahead of competitors, it is essential that factories give special attention to turning out standardised products. Chemical control of the processes of manufacture is essential if milk products of good quality and uniform composition are to be produced.

It is not suggested at this stage that complete chemical control should be established though this may ultimately eventuate, but a very decided advance would be obtained if factories regularly determined and recorded the percentage of the constituents of the butter produced which are known to be subject to considerable variation. Two such constituents are moisture and common salt (sodium chloride).

It is not, however, contended that these determinations can be carried out satisfactorily by anyone; the suggestion that they could be so carried out is about as valid as would be the assertion that the duties of manager, butter-maker or engineer could be carried out by anyone. Existing regulations require the engineer to possess a certificate of competency. Recognition of the principle of certification and competency has been given in the Dairy Industry Act, which requires that the position of cream grader and cream tester shall be held only by those having the necessary qualifications, and who hold a certificate of competency awarded after strict and careful examination. If the necessity for these be recognised under the Act, how much more necessary is it that those performing even simple determinations in the chemical control of the industry, should be thoroughly qualified to carry out such duties, and should be possessed of similar certificates of competency.

Several types of more or less simple apparatus involving the use of modified methods have been designed, and are sold to enable such work to be carried out, but the value to be placed on the results obtained will in a very large measure depend on the knowledge, skill, and training of the operator. The determination of moisture and salt in butter with sufficient accuracy for factory use, should not present any great difficulty to an efficient operator. The necessary facilities for doing the work include (*a*) a room free from draughts and currents of air, containing a suitable work bench or table, and provided with ample light; (*b*) suitable chemical apparatus.

To enable persons interested in the manufacture of dairy products, who either have the necessary apparatus, or who propose to acquire the same, to get a knowledge of the methods employed in ascertaining the percentages of moisture and salt in butter, the following information regarding apparatus and methods has been prepared. It is confidently expected that by following the instructions detailed below, an operator will soon acquire skill and dexterity in making the determinations. The question of making adjustments in the various types of balance and of keeping them in a satisfactory condition has not for obvious reasons been discussed, though the matter is of considerable importance.

Preparation of the Sample.

Aliquots should be taken from the box or worker by a "trier" or other suitable means. These should be placed in a clean, dry, glass-stoppered bottle of about 8 fluid ounces capacity, and the stopper inserted. Place the bottle in a vessel containing hot water till the butter is melted. Remove from the vessel and shake well to distribute the moisture uniformly throughout the mass; while shaking, allow a stream of cold water to run over the outside of the bottle to cool the butter. Continue this operation till the butter becomes first plastic and semi-solid, and finally sets hard.

In the sample so prepared, the moisture, salt, curd, &c., are uniformly distributed throughout the mass, and the butter is in a suitable condition for analysis and will remain so for some considerable time. In manufactured butter, whether in a butter box, keg, or on the butter worker, the moisture is not uniformly distributed throughout the mass. It is possible that determinations of moisture made on plugs removed by a butter trier from positions, say, near the four corners in the case of a box, or from the ends of a mass of butter on the worker, might show slight variation in amount of moisture present; the procedure described above is adopted to enable an average and representative sample to be obtained.

If the moisture content is to be determined at once, the determination may be made on the mixed aliquots when melted and before solidification, provided the sample is kept well shaken, and the necessary amount removed and placed in the nickel or porcelain dish or cup so rapidly that no separation of constituents has occurred. This procedure is merely referred to, but is not recommended for adoption, more especially in the case where constituents other than moisture are required. The whole value of the analysis or determinations even when accurately made will depend on whether the sample examined is thoroughly representative. Too much care, therefore, cannot be exercised in "taking" and "preparing" the sample.

Determination of the Moisture Content.

The method employed consists in taking a certain weight of butter, heating it by suitable means so that the moisture is driven off without affecting the other constituents, cooling the butter after the moisture is driven off and

weighing ; the loss in weight represents the water driven off. The percentage of moisture in the sample is computed from the following formula :—

$$\text{Percentage of moisture} = \text{loss in weight} \times \frac{100}{\text{weight of butter taken.}}$$

The method is universally applicable and requires a balance, weights, a dish in which to weigh and dry the butter, a suitable source of heat and a vessel in which to cool the dish after moisture is driven off (desiccator). In detail the following apparatus would be required :—

	Approximate Value. £	s.	d.
1. Rough chemical balance, agate knife edges on agate planes carrying 250 grams and turning with 2-milligram, levelling screws on sole plate of balance ...	3	10	0
2. Set of weights, 100-gram to 1-milligram, or two only 10-gram weights, one each 1-gram, ·5-gram, and ·2-gram, three only ·1-gram weights ...	0	12	6
1 rider, ·1 gram ...	0	4	2
3. Aluminium cup ...	0	2	0
4. Spirit lamp (4 oz.) ...	0	2	6
5. Brass tongs, or ...	0	2	0
6. Iron tripod stand ...	0	1	6
Pipe clay triangle ...	0	0	3
7. Spatula vulcanite 5 in. ...	0	1	0
8. Desiccator ...	0	15	0

The necessary apparatus could be purchased in Sydney for about £4, or £5 5s. if a complete set of weights and desiccator is desired. The balance should be carefully unpacked, the parts dusted and balance set up and levelled by means of screws attached to sole plate, and adjusted. If possible, a glass case or frame with the front made to open (like a window) should be provided to cover the balance and protect it from dust and air currents.

If a complete set of weights is provided, proceed as follows :—

1. Place the dry, clean, empty aluminium or other cup on one pan of the balance (usually on the left-hand pan) and determine the weight by adding weights of suitable units and fractions to the other (right-hand) pan, till on raising the beam and allowing the balance to swing freely, equilibrium is established, indicated by the pointer attached to the beam coming to rest at zero, or swinging an equal number of division on both sides of the zero or 0 mark on the vernier. Note the weight in laboratory book.

2. Add to the cup an amount of the butter sample prepared as previously directed, approximately 10 grams. Weigh the dish and contents as directed above, and note weight.

3. Remove cup and contents from pan of balance. Hold the cup by brass tongs gently but firmly, or alternatively place cup on top of a pipe-clay triangle supported by an iron tripod stand.

4. Apply heat *gently* by use of spirit lamp or other suitable means, with the object of driving off moisture without affecting other constituents, *i.e.*, without charring the curd. A legitimate amount of time should be given

so that heat is applied gradually and evenly in driving off the water. If held by the tongs the cup should not be thrust into the flame or the flame allowed to run up the side of the cup, nor if the cup be placed on the porcelain triangle should the spirit lamp be raised so that flame touches and impinges on the side of the cup. If this is done the heat will not be uniformly communicated to the butter and the temperature at one part of the cup will be greater than at another part, with the result that the curd will probably be charred and in addition the water will be so rapidly disengaged that molten butter fat will probably be carried off by entrainment.

The melting point of butter-fat is 36 to 37 deg. C. The boiling point of water is 100 deg. C. (212 deg. Fah.), and this temperature is usually applied in moisture determinations. At a slightly higher temperature water is more easily driven out of the melted fat, but the temperature of any part of the cup should never be so high as would decompose the fat. The necessary heat should be applied gradually, and no attempt should be made by an operator to unduly hasten the expulsion of the moisture.

5. When the moisture has been expelled, the dish (cup) should be allowed to cool. The cup and contents must not be weighed while hot. If attempt is made to do so the placing of the cup on the pan of balance will warm the surrounding air, which will ascend, and will act against gravity (or the weights on opposite pan of balance) with the result that an incorrect weight will be obtained.

The cup and contents should be allowed to cool in an atmosphere free from moisture, so as to prevent the moisture-free butter absorbing moisture from the ordinary atmosphere. A dry atmosphere is provided in a desiccator, which is merely a cylindrical-shaped glass vessel, provided with a tightly-fitting top, and containing a compound such as strong sulphuric acid or calcium chloride, which abstracts the moisture from the enclosed air. When cold the dish (cup) and contents are weighed, and the weight noted.

If it should be desired to attempt a determination of the other constituents (fat, curd, salt) on the same aliquot of the butter sample, as described by Farrington and Woll in "Testing Milk and Its Products," 22nd edition, 1916, page 232, paragraph 271, the value of all subsequent determinations will depend on the accuracy with which the work up to this point (moisture determination) has been done. Too much stress, therefore, cannot be laid on the necessity for attention to details given, in order that the work may be done accurately.

It must be pointed out that the possible introduction of error into the determination, by cooling the cup and contents in the ordinary atmosphere cannot be disregarded. The error would be variable, depending on (*a*) the time in cooling, and (*b*) the condition of atmosphere as regards amount of humidity. Cooling by placing cup in ice cold water, and carefully drying outside of cup by means of a fine, clean cloth might prove satisfactory if

carefully done, otherwise this procedure might become a source of error, especially if an unsuitable or dirty cloth was used. The exclusion of error by the use of a desiccator is considered to be sufficient to warrant the use.

The following case will illustrate the method and its application :—

Weight of empty dish or cup (1)	=	30·50 grams.
,, ,, plus butter (2)	=	40·28 ,,
,, ,, ,, contents (after drying)(5)	=	38·77 ,,
Weight of butter taken = 40·28 minus 30·50	=	9·78 ,,
Loss of moisture = 40·28 minus 38·77	=	1·51 ,,
Percentage of moisture in sample = $1·54 \times \frac{100}{9·78}$	=	15·4 per cent.

If exactly 10 grams of butter had been taken the following data would have been obtained :—

Weight of dish (empty) (1)	=	30·50 grams.
,, plus butter (2)	=	40·50 ,,
,, plus contents after drying	=	38·96 ,,
Weight of butter taken = 40·50 minus 30·50	=	10 ,,
Loss of moisture = 40·50 minus 38·96	=	1·54 ,,
Percentage of moisture in sample = $1·54 \times \frac{100}{10}$	=	15·4 per cent.

In this latter case, the multiplication of the "loss in weight," viz., 1·54 by 10 is quickly done, and simply means shifting the decimal point one place to the right, giving 15·4. In the other case the division of 15,400 by 978 might take a little more time, but should present no difficulty to an operator possessing requisite skill and ability. The time taken merely to weigh the indefinite amount of butter (9·78 grams) should be very much less than that required to weigh exactly 10 grams of butter.

An Alternative Method.

When an operator has acquired the necessary technique, and has become thoroughly conversant with the method as outlined, the following modification would require the use of only a small number of weights, and would enable the percentage of moisture to be read directly and recorded. The weights required would be one 10-gram weight, one or two 1-gram weights, one ·5-gram, one ·2-gram, three ·1-gram weights, and a rider weighing ·1-gram. The beam of the balance on either side of the central knife edge should be divided into ten equal parts, as in the case of an ordinary chemical balance. If, in the make of balance available, the beam is not divided, this could be done by placing 0·1-, 0·2-, 0·3-, &c., to 0·9- gram weights on one pan of the balance, and then placing the ·1-gram rider on the opposite beam and adjusting till equilibrium is established, marking the points 1, 2, 3, 4, &c., to 9 with a lead pencil. Lead tares should be made for each aluminium or other cup in use, and the cup and tare marked either 1, 2, 3, &c., or *a*, *b*, *c*-. &c.

Then proceed as follows :—First see that the balance is working properly and is in equilibrium. Place the lead tare on the left-hand pan, and the dry and empty aluminium cup on the right-hand pan. Assure yourself that the one exactly counterbalances the other. Now place the 10-gram weight on the left-hand pan, and add butter to the cup on the right-hand pan till

on raising the beam the weight of butter counterbalances the 10-gram weight. Remove the aluminium cup containing the butter. Drive off the moisture from the butter and cool the cup in the manner previously described. Place the cup on right-hand pan and add from the list of weights mentioned such a number as will again counterbalance the tare plus the 10-gram weight, using the rider if and when necessary. Note the weights required. The 1-gram weight if used represents 10 per cent. of moisture in the sample, similarly the ·5-, ·3-, ·2-, and ·1-gram represent 5, 3, 2, and 1 per cent. moisture respectively, while the rider indicates the fractions of 1 per cent. Thus supposing the 1-gram weight and the ·5-gram weight were required, and the rider was at division 4 on the beam, the moisture lost amounts to 1.54-grams, and the butter contains 15·4 per cent. of moisture.

From the above it will be seen that any ordinary chemical balance can be used instead of a "moisture tester" as manufactured by various firms.

"Fucoma" Balance for Estimation of Butter Moisture.

This apparatus (which is essentially a balance or steelyard) consists of a beam supported on a central knife edge. The right-hand side of the beam, which is about 4 inches long is graduated into twenty equal parts and numbered 1 to 19, the 20th mark coinciding with the point of suspension of pan. The left side of the beam is of such a weight that when the balance is raised from the support this balances (*a*) the stirrup pan support, (*b*) the pan, (*c*) a weight (10 grams), and (*d*) an aluminium cup or dish of cylindrical shape $2\frac{3}{8}$ inches in diameter and 2 inches high. Two such aluminium cups are supplied. Weights in the form of riders are supplied, rider A weighing 2 grams, and B weighing 0·2 grams. The weight A when placed on the marks 2, 10, 18, will weigh $2 \times \frac{2}{20}$, $2 \times \frac{10}{20}$, $2 \times \frac{18}{20}$ grams, *i.e.*, 0·2, 1·0 and 1·8 grams respectively. This would represent ·2 x 10, 1·0 x 10 and 1·8 x 10, *i.e.*, 2, 10, 18 per cent. respectively of the amount of butter taken, *viz.*, 10 grams. Using rider A, the marks on scale or beam represent percentages—using the rider B the marks 1 to 9 represent tenths of 1 per cent.

The determination of the moisture in butter is carried out as follows with this type of balance:—

Adjust balance so that the weight of the aluminium cup and the 10-gram weight hanging in place balances the weighted end of the beam. Remove the 10-gram weight and add so much of the sample of butter (prepared as previously directed) to the cup as will again restore equilibrium in the balance system. Remove the cup and gently heat over lamp till the moisture is driven off. Cool the cup and contents; replace on balance pan, and adjust position of rider A, and finally rider B, till equilibrium is again established. Suppose equilibrium is restored when rider A is on mark 15 and rider B on mark 4, the percentage of moisture is 15 plus $\frac{4}{10}$ of 1 per cent., *i.e.*, 15·4 per cent.

The drawbacks of this apparatus are—(1) Knife edges and planes are steel on steel; these rapidly rust in moist climates, rendering balance unsensitive; (2) terminal support over terminal knife edge is fixed to the beam, and cannot be removed for cleaning; (3) the preliminary adjustment to ensure that cup and 10-gram weight balance the weighted end of the beam necessitates the shifting of the gravity bob on right-hand side of beam; this is likely to cause undue wear; (4) the usefulness of the apparatus as a balance is restricted to the determination of moisture in butter; (5) the cost of the apparatus is nearly double that at which necessary chemical apparatus, as previously detailed, can be purchased.

Sorensen's Apparatus.

The apparatus is essentially a form of balance or steelyard. The brass beam, about 7¾ inches in length, turns on a knife edge placed about 1¾ inches from the thick end of the beam, and the beam is so constructed that the weight of the right-hand portion of the beam (which is divided into sections numbered from 0 to 10, the mark 0 being nearest the knife edge) balances the weight of the other or left-hand portion of the beam, and also a nickel dish and glass stirrer and the brass support or stirrup. Three riders are provided, viz., (A) weighing 2·5 grams, (B) 0·25 grams and (C) 0·025 grams; also three nickel dishes the shape of a truncated cone, 1⅜ inches in diameter at the bottom, 2½ inches in diameter at the top and about 1¼ inches high. When the rider A is placed on mark 10 this balances a weight of 10 grams butter in the nickel dish.

In determining the moisture content of butter two methods of procedure may be followed—(*a*) when exactly 10 grams of butter is taken, and (*b*) when an indefinite amount less than 10 grams is taken.

The procedure with method (*a*) is as follows :—With the nickel basin plus the glass rod in place in the stirrup, the apparatus should be in equilibrium and the pointer at end of beam should be at zero. Place rider A on mark 10 on the beam and add butter to the dish till balance is again in equilibrium, and thus weigh off 10 grams of butter. Remove the nickel dish, warm over spirit lamp till all the moisture is driven off, stirring if necessary. Cool dish and replace in stirrup. Adjust riders A, B and C on beam till balance is again in equilibrium. Note the reading in terms of units and fractions (tenths and hundredths). For example, if rider A is on mark 8, B on 4, and C on 6, the weight of butter after drying is 8·46 grams, and the 10 grams butter has lost 10 minus 8·46, equal to 1·54 grams water. The percentage moisture in the butter is, therefore, 1·54 multiplied by 100 and divided by 10, or 15·4.

The procedure in method (*b*) is as follows :—See that the balance is in equilibrium as described for method (*a*). Place a quantity of butter (less than 10 grams) in the nickel dish. Determine the weight by adjustment of riders A, B and C on the beam till the balance is in equilibrium. Note the weight as units and fractions. Drive off moisture as before, cool and re-weigh

nickel dish and contents by again adjusting riders till equilibrium is established, and again record weight. Tables supplied by the makers of the instruments are then consulted to obtain the percentage of moisture in the sample.

For example, in tareing the butter (before drying), suppose riders A, B and C were on the marks 8, 4 and 2 respectively on the beam, then the weight of butter taken was 8·42 grams. Suppose that after drying, equilibrium was established when A, B and C were respectively on marks 7, 1, 2. Refer to the table and look up 8·42 and 7·12 in transverse columns. The number at the intersection of the columns (15·4) represents the percentage of moisture. This figure could easily be arrived at thus :—percentage moisture

$$= (8{\cdot}42 - 7{\cdot}12) \times \frac{100}{8{\cdot}42} = \frac{1{\cdot}3 \times 100}{8{\cdot}42} = 15{\cdot}4.$$

Objections to this form of apparatus is that the nickel dishes supplied are not of identical weight, and require to be compensated for by moving the adjusting screw at end of beam. They are rather shallow, and unless the heating is done carefully there is a tendency for fat to splutter and some to be lost. The smaller riders B and C not infrequently break at the shoulder. In the balance the knife edges are steel on steel; in moist climates these rapidly rust and the sensitiveness of balance is impaired.

Kohner Mendelsohn Apparatus.

The apparatus used in connection with the "Kohner Mendelsohn method for proximate analysis of butter" includes the following:—Chemical balance (open); aluminium cup; tongs for holding cup; spirit lamp; 50 c.c. glass-stoppered burette graduated in 1/10th c.c., and wood burette stand; petroleum ether (sufficient for a few determinations); standard solution silver nitrate (1 c.c. = ·01 gr. salt); aqueous solution potassium chromate.

The methods given for the determination of the various constituents are essentially those outlined many years ago, with the exception that instead of drying at 100 deg. C., the moisture is driven off over a naked flame. An outline of the method is given in "Testing Milk and Its Products," by Farrington and Woll, 1916 edition, page 132, to which advanced students are referred.

It should be pointed out that as the complete analysis is carried out on one portion of butter, and the residue from the first and subsequent determinations is used for the estimation of the other constituents, any inaccuracy in one will be reflected in the complete analysis, and the possibility of the occurrence of errors of sufficient magnitude to render the analysis of little, if indeed of any, value cannot be ignored, more especially in the hands of an untrained operator. The accuracy of the determinations and the value of the data would largely depend on the skill and knowledge of the operator, and whilst results of approximate accuracy might possibly be obtained by a trained analyst, such could not be done by the untrained or uninstructed person.

The contention of the vendors that no chemical knowledge or skill is required beyond that possessed by a cream tester cannot be endorsed, nor can the claim that the whole of the determinations can be carried out in less than half an hour. The adoption of this apparatus and methods of analysis would be of doubtful value, and might even be fraught with danger.

Determination of Salt in Butter.

Besides a balance and weights the necessary apparatus for the determination of the salt in butter consists of :—

	Approximate Cost. £	s.	d.
1. Glass-stoppered burette 0 to 25 c.c. or 0 to 50 c.c. divided in tenths...	4s. and 5s. 6d		
2. Wood burette stand	0	4	0
3. 250 c.c glass measuring flask	0	2	6
4. 25 c.c. pipette	0	1	6
5. Glass separating funnel 200 or 250 c.c.	0	7	0
6. Iron retort stand and ring of about 3 inches diameter	0	5	6
7. One porcelain basin 4 inches diameter	0	1	6
8. Stirring rod	0	0	2
9. Solution of potassium chromate			
10. Deci-normal solution of silver nitrate			
(If desired a "standard" solution of silver nitrate, 1 c.c. of which corresponds to 0·005 grams sodium chloride may be used.)			
11. Wash bottle (1000 c.c.)	0	3	0

Prepare the sample of butter for analysis as previously directed, weigh off 25 grams of prepared sample in a nickel dish or small glass beaker. Melt the weighed butter by placing the dish in hot water, and transfer the melted butter as completely as possible to the glass separating funnel which has previously been warmed by addition of hot water in small quantities, gradually rotating the funnel, and finally running off the water by means of the glass tap. Wash any remaining butter out of the nickel or other dish by means of hot water, using the stirring rod if necessary, and add washings to the melted butter in the funnel. The volume of hot water added should approximate 50 c.c. Rotate funnel and contents so as to bring the water and butter into intimate contact to effect solution of the sodium chloride. Do not shake violently since emulsification might be effected. Allow to stand till the contents of the funnel separate into two layers, an upper layer of melted fat and a milky aqueous extract. Run the latter off very gently and gradually into the 250 c.c. flask, stopping the flow of aqueous extract when fat is visible in the upper part of the V portion of the funnel (immediately above the tap). Allow to settle for a few minutes and again run off any drops of aqueous extract, taking care that all the fluid is transferred from the stem of funnel into the 250 c.c. flask and that no drops are left adhering to stem.

Now add a further aliquot of 50 c.c. hot water to the funnel and repeat the previous operations; allow mixture to settle and draw off the aqueous extract as completely as possible into the 250 c.c. flask in the manner already explained. Continue to wash the butter in the funnel with successive aliquots of 50, 40, 30 and 20 c.c. water adding the washings to the contents

of the 250 c.c. flask. Now cool the 250 c.c. flask and contents; make up exactly to the mark by addition of cold water, insert the stopper and thoroughly mix the contents by shaking.

Withdraw a 25 c.c. aliquot of the aqueous extract by means of the pipette after first rinsing it with the extract, transfer to the 4-inch porcelain basin and add a few drops of the indicator, which is an aqueous solution of potassium chromate. This solution is used as an indicator because silver has a greater affinity for chlorine or a chloride than it has for a chromate. Silver chloride is of a white colour, while silver chromate is red. When a solution of silver nitrate is added to a solution containing both a chloride and a chromate the silver will combine with the chloride, forming silver chloride so long as any sodium chloride remains in solution. When the whole of the sodium chloride has combined with the silver, the addition of any further quantity of silver nitrate results in the production of silver chromate, which is red in colour. The transition point is indicated by the change in colour from white tinged with yellow to faint brick red.

Deci-normal silver nitrate solution is, therefore, added in small quantities at a time and finally drop by drop to the 25 c.c. aliquot in the porcelain basin, stirring after each addition to ensure thorough mixing till the transition point, indicating that the whole of the chlorine has formed silver chloride, occurs. The number of c.c. silver nitrate solution used is recorded, and from this the amount of sodium chloride in the aliquot is calculated.

Suppose for example 10·3 c.c. were required, then as—

1 c.c. $\frac{N}{10}$ silver contains the equivalent of ·00585 grams sodium chloride;
10·3 c.c. $\frac{N}{10}$ silver contains the equivalent of 10·3 × ·00585 grams sodium chloride;
25 c.c. aliquot aqueous extract contains 10·3 × ·00585 grams sodium chloride;
250 c.c. aqueous extract contains 10 × (10·3 × ·00585) grams sodium chloride;
25 grams butter contains 10 × (10·3 × ·00585) grams sodium chloride;
100 grams butter contains $\frac{100}{25}$ × 10 × (10·3 × ·00585) = 2·40.

If a "standard" solution of silver nitrate of such strength that 1 c.c. contained the equivalent of ·005 grams sodium chloride had been used, then 12·0 c.c. of such solution would have been required to precipitate all the chloride in the 25 c.c. aliquot of aqueous extract. The percentage of sodium chloride in the butter would be arrived at in the manner similar to that previously described. Thus as—

1 c.c. standard silver contains the equivalent of ·005 grams sodium chloride;
12 c.c. standard silver contains 12 × ·005 grams sodium chloride;
25 c.c. aliquot aqueous extract contains 12 × ·005 grams sodium chloride;
250 c.c. aliquot aqueous extract contains 10 × (12 × ·005) grams sodium chloride;
25 grams butter contains 10 × (12 × ·005);
100 grams butter contains $\frac{100}{25}$ × 10 × (12 × ·005) = 12 × $\frac{1}{5}$ = 2·40.

It should be pointed out that deci-normal solutions are of a definite fixed strength, while the strength of "standard" solution will vary according to the conditions under which it is to be used. Confusion as to the strength of a "standard" solution might, and possibly would occur, which could not take place in the case of a deci-normal solution.

Farm Forestry.

V.—The Native and Introduced Trees of New South Wales.

[Continued from page 842.]

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Native Tree Flora of Western Slopes Division—*continued.*

The Kurrajong (*Brachychiton populneus*), fully described on page 619 of the August, 1928, issue of the *Agricultural Gazette*, is widely distributed and of outstanding usefulness in many parts of the Division.

White Cypress Pine (*Callitris robusta*) is also a common and characteristic feature of the tree flora, being most frequently associated with Ironbark (*Eucalyptus crebra*) in the western and central subdivisions, and with the White Box (*Eucalyptus albens*) in parts of the south.

The Black Cypress Pine (*Callitris calcarata*) is also a common species. (See pages 625 and 626 of *Agricultural Gazette*, August, 1928, for full description of the Cypress Pines.)

Apples (*Angophora* spp.).

In New South Wales there are six species of trees which are included in the genus *Angophora*. Three of these occur in the Western Slopes and Western Plains Divisions, viz., *Angophora intermedia*, *Angophora ochrophloia*, and *Angophora melanoxylon*.

Angophora species are widely and almost universally known as "apples," although this name, as previously mentioned, is also applied to *Eucalyptus Stuartiana*. Apples closely resemble *Eucalyptus* species in their general appearance, but can be readily distinguished from such by three characteristics. Firstly, the leaves are opposite each other on the twigs or branches, whereas in *Eucalypts* they are always alternate, except in the juvenile stage. Secondly, the capsules have five teeth round the rim and raised ridges on the tube, the whole fruit being softer and more papery in texture than that of *Eucalypts*. Thirdly, there is no operculum or cap covering the undeveloped flowers.

Angophora intermedia.—The most common and widely distributed of the apples in the Slopes Division is *Angophora intermedia*. This is a medium to fairly large tree with spreading crown and frequently crooked branches. It is most commonly found on alluvial soils and deep sandy loams along flats and watercourses, but also extends to hillsides, sometimes showing a partial preference for those of limestone formation. It occurs both in the central and northern subdivisions, extending in parts to the Western Plains, and, generally speaking, keeps to the north of the main western railway line. It is also fairly plentiful in some coastal areas.

Uses.—It makes a very useful shade and shelter tree, stands lopping well, and has fairly dense foliage. It is a moderately useful reserve fodder tree, but, being rather harsh and not very nutritive, should only be regarded as famine fodder. The timber is pale-coloured, close-grained and hard when seasoned, but is usually marked with gum veins, and is not regarded as first class. It is, however, useful for general work, and appears to stand dampness well. It is frequently used for making naves and spokes (wheelwrights' work). It burns well as a fuel. A good honey tree, being very free flowering.

Apple (*Angophora intermedia*).

Coolabah Apple (*Angophora melanoxylon*) is also found in scattered localities in the Slopes and Plains Divisions. It is particularly common round about Coolabah, where it forms a rather ragged, crooked tree of about 40 feet in height. It is also found at such localities as Bourke and Moree, but is not so important a species as *Angophora intermedia*.

Angophora ochrophloia is another apple occurring both on the eastern and western sides of the Dividing Range, the leaves of this species, on drying, showing a decided yellowish tinge, distinguishing it from other apples. The western localities include Coonamble, Bingara, and the banks of the Castlereagh.

The Smooth-barked Apple (*Angophora lanceolata*) is found in one or two isolated parts of the north-western subdivision on poor sandstone country, but is typically a coastal division tree.

RED ASH (*Alphitonia excelsa*).

This species occurs as a large tree up to 70 feet in height in rain forests of the Coastal Division, but also extends to the North-western Slopes, where it is found as a rather small tree, frequently on rocky ridges. In Queensland it is also fairly common in the interior of the Brigalow scrubs. On the coast it is sometimes known as "Leather Jacket" or "Cooper's Wood," and can be recognised by the peculiar odour, resembling sarsaparilla, of the young shoots when bruised or broken.

Leaves entire, 3 to 6 inches long, glabrous and green above, white underneath. Flowers small, in dense cymes or panicles. Fruit a globular, dull bluish-black drupe about ½ inch diameter, and with shiny reddish-brown seeds.

Uses.—This tree provides very useful fodder, both sheep and cattle being fond of it, and is not so astringent as some of the other edible species. The timber, when first cut, is pale-coloured, but gradually darkens at the heart. It is straight-grained and works easily, but is tough and suitable for handles, &c. This tree can be raised fairly easily from seed, is comparatively fast growing, and is worthy of planting as a fodder and shelter tree.

RIVER OAK (*Casuarina Cunninghamiana*).

A medium to tall tree, invariably found along or close to the banks of fresh-water streams in all divisions of the State except the Western Plains. On the Western Slopes it keeps to the upper eastern parts of watercourses, not descending to the lower slopes and plains, where the River Gum (*Eucalyptus rostrata*) is found. The two species overlap to some extent about half-way up the slopes, as, for example, at Forbes on the Lachlan, where the River Oak continues upwards and the River Gum downwards.

Branchlets slender, erect. Cone usually globular, glabrous, and the smallest of the genus, being usually under ½ inch diameter.

Uses.—It is the natural bank protector of our watercourses, playing an important part in preventing excessive erosion. The large spreading roots hold the banks together, and for this reason it should always be spared from the axe wherever possible. The foliage is a moderately useful drought fodder. The young seedlings, being relished by stock, require some protection in the way of fencing if natural regeneration is required. The timber is pale-reddish, fairly light and tough, and is used for shingles, yokes, &c., and might be suitably employed where a light, strong timber is required. An excellent fuel. When well grown it makes a particularly handsome and ornamental tree. South African experience has shown that this species will also stand a good deal of drought in dry soils.

DROOPING SHE OAK OR MOUNTAIN OAK (*Casuarina stricta*).

A tall shrub or small tree always found on dry ridges and rocky soils, generally in open country, but showing no particular preference for any soil type. It occurs on both sides of the Dividing Range, and although fairly widely distributed in the central and southern subdivisions of the Slopes, is gradually being exterminated by stock. The branchlets are usually pendulous, as the vernacular name indicates.

River Oak (*Casuarina Cunninghamiana*)

Branchlets fairly robust, prominently ribbed. Male spikes dense, often above 2 inches long. Cones about 1 inch diameter, the valves much protruding.

Uses.—A very useful fodder plant, stock being fond of it, and able to live for fairly long periods on the nutriment afforded. It stands lopping well. Timber reddish, and useful for small articles, such as handles, yokes, &c. An excellent fuel. A moderately useful shade and shelter tree.

A third species of *Casuarina*, *Casuarina paludosa*, is also found in this Division. It rarely, however, exceeds 15 feet in height, and is usually a small shrub found on rocky ridges and dry hillsides. The branchlets are slender and the cones small.

NATIVE CHERRY (*Exocarpus cupressiformis*).

A small tree or tall shrub with rough, dark-brown bark, most commonly found on sides of hills and rocky ridges, although not confined to such sites. It is found in all three subdivisions, and extends to the Tablelands and Coastal Divisions as well, having a wide distribution.

True leaves reduced to scales, the branchlets resembling foliage. Flowers minute, in axillary clusters or spikes. Fruit a nut resting on an enlarged succulent and berry-like bright red stalk.

Uses.—Well-grown trees form shapely ornamental trees, with a fairly dense olive-green foliage, and are useful for shade and shelter purposes. The foliage is eaten by stock to some extent during drought periods, cattle showing a liking for it, but sheep tiring after a short period. This species, however, has been shown to be parasitic on the roots of other trees, a circumstance which frequently makes it conspicuously green and fresh-looking during dry and droughty periods. Difficulty may therefore be experienced in cultivating it away from other trees, although possibly it would make good growth by itself.

Another species of *Exocarpus*, viz., *Exocarpus aphylla*, known as "Stiff or Jointed Cherry," or occasionally as "Currant Bush," is also found in the Slopes Division. It, however, is only a shrub, and the branchlets are much stouter, more rigid, and almost thorny in comparison with the Native Cherry.

Minor Species.

Notelaea microcarpa is a small tree or large woody shrub belonging to the Olive family. It frequently throws up a number of thin, crooked stems with a grey or dull black bark, and although found on a variety of soils, is most common on rather poor, stony types. The leaves are narrow and rather sparse, but are said to make fair fodder during drought periods, especially for sheep. The fruit is a small white or purplish drupe. The tree extends from the Tablelands to the Western Plains, and is most common in the northern subdivision.

Melaleuca uncinata, a species with needle-like leaves and pale yellow flowers, often known as "Youngie Bush" or "Broom Brush," is found abundantly on rather poor land associated with ironbark forests. It is also not uncommon along creeks to the north-east of Boggabri, where it forms clumps of small trees up to 30 feet in height, and is useful for shelter purposes.

Two species are known as "Dogwood" within the Division, viz., *Jacksonia scoparia* and *Myoporum deserti.*

The former is an ornamental shrub rarely exceeding 20 feet in height, with leafless, pendulous branches, and bears a profusion of sweet-smelling bright yellow or orange pea flowers. It occurs most frequently on the coast and tablelands, but is found in a number of localities on the Western Slopes, being most common on rather poor stony soil. The timber when burnt gives off an unpleasant odour. This species is also known as "Stinkwood" or "Native Broom."

Myoporum deserti is usually a shrub, but occasionally forms a small, rather graceful tree, which is useful for shelter and ornamental purposes. It is found fairly abundantly in parts of the Slopes, and extends to the Western Plains. The leaves are narrow and the flowers bell-shaped, small, and usually white. The fruit is a small yellowish drupe.

Celastrus Cunninghamii is a fairly common shrub, which extends from the Tablelands to the Western Plains. Sheep and cattle are said to eat it.

The Varnish Bush (*Olearia elliptica*) is also eaten by sheep to some extent.

Acacias.

The flora of the Western Slopes is moderately rich in *Acacia* species, some of which reach tree size, and are useful to the pastoralist.

A number of the Western Plains species, described in the *Agricultural Gazette*, October, 1928, pages 762-765, are also found in the Slopes Division, including Myall or Boree (*Acacia pendula*), Yarran (*Acacia homalophylla*), Currawang (*Acacia doratoxylon*), Ironwood (*Acacia excelsa*), Brigalow (*Acacia harpophylla*), Cooba or Native Willow (*Acacia salicina*), Miljee (*Acacia Oswaldii*), and *Acacia decora*.

The Yarran is found as far east as Capertee, but is not common in the eastern half of the Division. Myall is also restricted to the lower western slopes.

Other *Acacias* which form large shrubs or small trees include the following species:—

MOTHERUMBAH (*Acacia Cheelii*).

A shrub or small tree up to 35 feet in height, usually found growing in semi-exposed situations on the rocky or stony sides or summits of hills. It is found mainly in the northern subdivision, and is occasionally known as "Curracabah," a name more generally applied to *Acacia Cunninghamii*.

Phyllodes (leaves) glaucous, falcate, 4 to 7 inches long, ½ to 1 inch wide, Flowers in spikes, in pairs or threes. Pod narrow, linear, straight, or nearly so, flat with thickened margins.

Uses.—This species makes a useful shade and shelter tree, especially in somewhat exposed situations on hillsides. The leaves are held in high esteem by local settlers as a very useful fodder, both for cattle and sheep, during drought periods, being ranked by many with Kurrajong.

CURRACABAH (*Acacia Cunninghamii*).

A shrub or small tree found in the northern and central subdivisions, and extending to the northern portion of the Coastal Division.

Leaves 4 to 6 inches long by 1 to 1½ inches broad, with three to five prominent parallel veins and numerous finer ones. Flowers in spikes 2 to 3 inches long. Pod long, narrow, and twisted.

This species is also known as "Bastard Myall" or "Motherumbung," the latter name, however, being more generally applied to *Acacia Cheelii.* The timber is close grained, dark in colour, and heavy, but is too small for general purposes. The green pods are rich in saponin, the plant being suspected of having poisonous properties.

COOTAMUNDRA WATTLE (*Acacia Baileyana*).

A small ornamental and graceful tree with a very limited natural distribution, being found only in the Cootamundra and Wagga districts, and possibly at Temora and Barmedman. It has, however, been widely cultivated in many parts of the State, and in some cases has started to spread naturally from old planted trees.

Leaves bipinnate, the leaflets numerous and more or less silvery. Flower heads in axillary panicles, the upper ones forming usually a terminal panicle. Pod flat, nearly straight, about ½ inch broad.

Uses.—This wattle is fairly hardy, fast-growing, and ornamental, and is useful for windbreak formations, and for small shade and shelter trees. If kept cut back it makes a good hedge of the large type. It is, however, short-lived, but can provide shelter, &c., while the more slowly-growing but long-lived species are establishing themselves. The pale-coloured timber is of little use except for fuel.

WESTERN BLACK WATTLE (*Acacia hakeoides*).

A tall shrub or small tree, rarely exceeding 25 feet in height, fairly widely distributed in the Slopes and Plains Divisions, mainly on light sandy soils or sandy loams, although also found on heavier soils.

Phyllodes 2 to 5 inches long, rather thick, narrowed at base. Flowers in globular heads arranged as racemes, which are shorter than the phyllodes. Pods long and narrow, much contracted between the seeds.

This species frequently forms dense, almost impenetrable thickets, which are often difficult to clear owing to the free suckering habit of this wattle. In some districts it has been found necessary to drag out roots and all by horses or bullocks in order to secure permanent eradication. Although sometimes growing into a small tree, it is usually only a shrub, and its timber is therefore of little use except in a minor way for fuel.

A SILVER WATTLE (*Acacia neriifolia*).

A tall shrub or small tree, usually with a silvery vestiture, and found on a variety of soils, but perhaps most commonly on those from granitic or andesite formations. It occurs mainly in the northern subdivision, extending to the Tablelands, and is not uncommon in New England. It is sometimes known as "Bastard Yarran."

Phyllodes thick, fairly narrow, 3 to 6 inches long. Flowers in slender racemes. Pods flat, straight, or slightly curved, about ½ inch broad.

Uses.—It is an ornamental species, and is eaten by stock to some extent, sheep being said to eat it better than cattle.

Acacias of Minor Importance.

Nealie or Needle Wattle (*Acacia rigens*) is a shrub or occasionally a small tree with a stringy or flaky bark, the phyllodes varying from very narrow or needle-like to a broader type. Plants with the latter are generally termed "Nealie." It occurs in the western portion of the Division and in the Western Plains. The timber is dark-coloured, like that of the Myall, and has a pleasant odour.

Acacia spectabilis is a glaucous or pruinose shrub or small tree, rather weak growing and thin stemmed, the branches often contorted and twisted. It is fairly widely distributed in the northern subdivision, and to some extent in the central, extending into Queensland, and being not uncommon on granitic areas on the New England tableland. It is locally known as "Golden Wattle" (one of the many species so termed), and is very ornamental in appearance, being frequently cultivated for this purpose, both within New South Wales and elsewhere.

Green Wattle (*Acacia mollissima*) reaches its best development on the Tablelands, and will be more fully described when dealing with that Division. It is found in a number of localities on the Western Slopes but its growth is usually rather stunted.

Hickory or Broad-leaved Wattle (*Acacia implexa*) is more plentifully distributed in the Coastal Division, but is also found on the Western Slopes, extending as far west as Nymagee. It forms a small tree, and is most commonly found on ridges of igneous rock in this Division. The leaves are eaten by stock to some extent. It is sometimes known locally as "Bastard Myall."

Acacia cardiophylla is a beautiful, free-flowering, pubescent shrub with bipinnate leaves, the leaflets being very small. It is usually found on sedimentary ridges or fairly sandy loams on the banks of dry watercourses. It is an ornamental shrub, well worthy of cultivation as a garden subject.

Acacia difformis is a shrub or small tree found in the central and southern subdivisions, mainly in the Wagga, Temora, Wyalong, and Dubbo districts. It occasionally forms scrubs covering acres in extent.

Acacia undulifolia is a small shrub, often scrambling in habit, and found chiefly in rocky situations on hills and ridges in scattered parts of the Division. It extends to the Tablelands.

Acacia conferta forms an ornamental shrub, and is usually found on sandy soil, sometimes forming a fairly dense undergrowth to Cypress Pine, Ironbark, and Box. It occurs mainly in the northern subdivision on the western fringe, being particularly common in the Pilliga, but is also found in the Dubbo district in the central subdivision.

The Kangaroo Thorn or Prickly Wattle (*Acacia armata*) is not uncommon in some portions of the Division, and extends to the Tablelands. It forms a shrub profusely armed with slender spines.

(*To be Continued.*)

The Sheep Blowfly.

Cause, Effect, Prevention, and Treatment of *Cutaneous myiasis*.*

(Concluded from page 807.)

TREATMENT OF SHEEP FOR BLOWFLY PREVENTION.

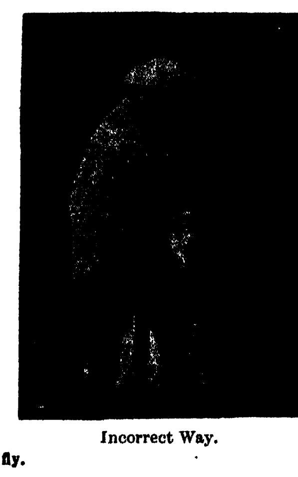
With regard to measures to be taken with the sheep, fly prevention may be carried out in four main directions, namely:—

(*a*) Shearing and crutching,
(*b*) Dipping,
(*c*) Jetting,
(*d*) Swabbing.

Shearing and Crutching.

Shearing is, of course, the usual flock practice, but its performance is a very marked and efficient preventive of fly attack. The short wool left does not readily become soiled, and if it does become urine- and dung-stained it usually dries rapidly, partly from the warmth of the skin of the sheep, but chiefly because the dry atmosphere can penetrate it readily. Strikes are therefore the exception until there is six weeks to two months' growth of wool.

Correct Way.



Incorrect Way.

Crutching for Blowfly.

Crutching is the shearing away of the wool from the vicinity of the breech, thereby rendering that part in much the same condition as in a newly-shorn sheep. To be effective it must be done properly—that is, evenly and over a sufficiently wide area. The area should be such as to include those parts commonly struck or liable to hold filth in the way of urine or dung, or discharges following lambing. It should extend above the tail

* The matter in this leaflet was compiled by the External Parasites of Sheep Committee.

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on both sides of the breech so as to include the two wrinkles commonly present, one on each side of the tail, as well as the crutch proper (*i.e.*, the fork between the legs) and—this is very important—down the back of the legs to the hocks. The actual area is best seen from the accompanying illustrations, which show both the correct and the incorrect methods of crutching. Crutching is done usually just prior to lambing; it should be done as close to lambing as practicable, as it permits of the ewe being kept in a much cleaner condition during that time than would otherwise be the case.

Crutching is probably the most widely carried out preventive measure, and its value is undoubted.

Dipping.

It has been claimed that dipping is a reliable preventive of sheep blowfly attack. Cases have been known to occur, however, within a matter of days after dipping, and records of dipped and undipped sheep show that apart from a short period (three or four weeks), wherein it may offer some protection, it is not of marked value. The act of dipping cleanses the crutch of the sheep, and that part is rendered for a short period less likely to be struck by fly by reason of the fact that the dip itself has some repellent properties and recently dipped wool is not so likely to suffer those decomposition changes that render the vicinity of the breech an attraction to the fly. When these effects have worn off, however, which is usually within a few weeks, the sheep are no longer protected from fly attack. It is the fact that the use of an arsenic dip does afford some, if temporary, protection that has led to the adoption of jetting as a preventive, the solutions employed in such cases usually containing a particularly high percentage of arsenic.

The act of dipping will usually kill any maggots on blown sheep, but severely blown sheep should not be dipped owing to the danger of arsenical poisoning.

Jetting.

By jetting is meant the spraying of the rump and crutch of the sheep with (usually) an arsenical solution forced through a single jet at high pressure. The method had its origin in Queensland, where some years ago it was used extensively, with, it is claimed, marked success. The concentration of arsenic (dissolved by adding the appropriate quantity of soda) may vary from 2 to 10 lb. per 100 gallons of water. Special pumping engines are on the market for the purpose of jetting, and, needless to say, the solution should be carefully and accurately prepared. The sheep are best placed in a race, which may be of a special kind; but provided it allows the operator thoroughly to saturate the wool of the hind parts of the sheep any race will do. The pressure should be kept as constant as possible throughout, and the minimum pressure to ensure penetration to the skin should be used. It will thus vary according to the length of wool—from 100 to 160 lb. to the square inch. With sheep carrying about three months' wool the amount of fluid required for each sheep is about a quart, and a pressure of 120 to 130 lb. should suffice.

The nozzle of the jetting piece should have a diameter of 3-32nd inch, and it should be held from 12 to 15 inches away from the sheep. High pressures, especially if the jet be held close to the sheep, are liable to "cut" the skin, with serious after-effects. Sheep are not usually jetted until they have two or three months' growth of wool. If jetting has to be done earlier great care must be taken to see that only a low pressure is employed, as otherwise such sheep are extremely liable to have the skin cut or old shear wounds opened. Further, for jetting to be of value there should be sufficient wool to retain an appreciable amount of the solution employed. The time it takes to jet a sheep varies according to the convenience of the race, and whether

Jetting for Sheep Blowfly.

the sheep stand still or not. It usually takes a minimum of six seconds per sheep to jet properly. The operation can, of course, be speeded up, but in such case there is a great likelihood of some sheep being not properly wetted. Particular care should be taken to see that the wool for 4 to 6 inches above and at each side of the tail is saturated with the fluid.

Needless to say, sheep should not be mated immediately after jetting.

As to the efficacy of jetting, the Department is as yet unable to endorse the system entirely. Theoretically, it should afford a limited protection from fly—say, for two months—and in many cases this has been apparent. In others, however, the results have been far from encouraging. The Department is still conducting investigations and aims to discover a jetting fluid (arsenical or otherwise) which will give to jetted sheep for, say, three

months, such a degree of protection as will justify its general use. One great difficulty in the past has been to forecast fly attack sufficiently accurately to time the jetting to take place a maximum of two to three weeks before a general fly attack.

Like dipping, jetting destroys or removes the maggots, and at times advantage has been taken of this fact to pass a maggoty flock through the jetting race. Great care should be taken in such cases, as the risk of arsenical poisoning resulting from jetting sheep with fly-blown wounds is infinitely greater than if the sheep are free of fly strikes. Nevertheless, if due precautions are taken to hand-dress instead of jet badly struck sheep, the procedure has much to commend it when fly attack is common and there is difficulty in treating effectively by hand the large number of sheep that are being struck.

Swabbing.

This consists of the application of a preparation to the crutch by means of a swab instead of with a jetting machine. It is, therefore, especially well adapted for small flocks or when the medicament it is proposed to employ is of such a nature as would not lend itself to jetting or when such a procedure would be wasteful. Swabbing may, of course, be done both from the curative as well as the preventive point of view, but the former will be discussed under methods of treatment.

The usual method is to apply the dressing with a small swab or mop made of rags tied on to the end of a stick. This may be dipped in the dressing or (and this is less wasteful) the dressing may be poured on from a bottle or tin and spread well with the swab. In all cases care should be taken to see that the wool of the crutch (including both sides of the tail and the stump as well as the inside of the hind legs to the hocks) is well saturated.

Some years ago the Department tested a number of preparations, both proprietary and otherwise, as to their value as preventive swabs. These preparations included a watery solution, an emulsion, and soaps and oils of varying viscosity all containing one or more maggot-destroying chemicals, but the conclusion was reached that none of these preparations could be considered satisfactory as preventive dressings against sheep blowfly attack. Here, again, it is hoped that there may be evolved a dressing which will give a reasonable degree of protection for a period of, say, three months. To expect that any method would give protection for a greater period is probably fallacious, as with the growth of wool any medicament is lifted off the skin, which is thereby deprived of the protection in the dressing in the wool above it.

There is reason for the belief that the most effective swabbing mixtures from the point of view of repulsion are not necessarily highly odorous materials (*e.g.*, essential oils), or even highly-irritating materials, such as chloropicrin, but materials which can absorb or inhibit the formation of the volatile compounds evolved by decomposing meat which attracts flies.

II. Treatment of Fly-blown Sheep.

Individual sheep can often be caught and treated in the paddock, but with a serious infestation it may be necessary to yard the flock or run them into a suitable corner so that they may be examined thoroughly and none may be missed. Struck sheep may show maggots either (*a*) in wounds in the skin, or (*b*) in the wool only.

In the former, maggots are usually found in the depth of the wound, and, provided the wound is an open one, one dressing is usually fatal to all maggots, but such a wound is liable to be re-struck in a few days. Sheep so affected therefore require dressing as often as they are re-struck. These wounds may have been caused by injury, such as shear cuts, crow "picks," &c., and have subsequently become invaded by flies with consequent deposition of maggots, or the wounds may have followed a striking of the wool by maggots. In other cases the wound is not an open one. It is deep, or the sides are under-run, pus and maggots being to a greater or lesser extent hidden from sight. Such wounds require careful and often repeated dressing.

When only the wool is struck, the size, age and vitality of the maggots is of importance. If the dressing is applied merely over the wool and rubbed well in the smaller maggots are destroyed, but the larger ones may overcome the effects of the dressing and move to new grounds to carry on their parasitic existence. Also, if the wool is not removed it is sometimes difficult to gauge the area in which the maggots are working, and consequently some may be missed when rubbing in the dressing.

The affected sheep is caught and held in a convenient position while the wool around the affected area is shorn off close to the skin in such a way as to define completely the struck patch, and leaving a border of at least an inch of normal wool all the way round; all "daggy," matted, or soiled wool about the breech of the sheep should be cut away. This lessens considerably the chances of a strike on some other part of the sheep. The struck area may be traced from the discolouration of the wool by the exudate that is given out. The wool close to the struck patch generally has a moist, clammy appearance, and is lacking in the lustre of normal healthy wool.

It is now desirable to remove all maggots This can be done by striking the area briskly with the flat side of the shears, when the majority will be shaken off. Generally a few remain on, particularly in the case of wrinkly sheep, when they burrow down into the wrinkles. If time permits every maggot should be removed, but this is not always possible, and the dressing must serve to destroy the few that are left.

The dressing can be carried conveniently in a bottle, from which it may be poured on to the struck area, to be rubbed well in with the blades of the shears. It is necessary to rub the dressing well into the wrinkles and around the edges of the area, as the maggots move quickly and seek to hide themselves in the hollows of the wrinkles and in the unshorn wool. Again, after the wool has come away from a struck area a scab often forms over the raw

patch, and under this scab maggots are frequently found. It is useless in such a case merely to apply the dressing over the scab, as it does not reach the maggots underneath, and they thrive as though nothing had been done to check them. It may seem to be retarding healing to remove a scab to get at the maggots, but this action is necessary. With a badly struck sheep one dressing may be insufficient to cure the extensive wounds, hence it is necessary to continue the treatment until the wound is completely healed. The wound is liable to be re-struck as long as there is moisture on the surface. It may scab over and become dry on the surface, but if the scab becomes knocked off before healing has taken place underneath a re-strike may follow.

A dressing should have the following properties:—

1. It should destroy maggots without injuring the sheep or the wool.
2. It should be soothing and healing to the wounds.
3. It should adhere to the wool and the affected area of skin.
4. It should be repellent to the fly and thus prevent re-strikes for a reasonable time.

After dressing—unless it is a very severe case, when it may be penned or paddocked separately to facilitate further dressing—the sheep can be let go again amongst the flock. One dressing is sufficient in most cases for the treatment of a strike, provided, of course, that it has been detected before the effects have become severe, which can only be assured by careful and regular inspection of the flock at sufficiently close intervals. It is a good plan for the stockman to keep the dressing in a bottle tied to his saddle, so that it is available at all times.

There are many proprietary dressings on the market; owners, too, frequently make up mixtures to their own ideas. The Department at one time recommended a dressing containing arsenic in an oily emulsion, but further tests are in progress to determine what type of dressing gives the best results.

CHEMICAL NOTES ON MATERIALS USED AGAINST THE BLOWFLY.

Among the constituents of proprietary and other preparations which have been tested are the following:—

Neutral Tar Oil.—Tar is obtained by the destructive distillation of organic substances and bituminous material, and is a viscid dark-coloured oil, with a more or less characteristic odour, and a composition which varies widely according to its source and the conditions under which it has been distilled. From some of these tars, *e.g.*, coal tar, redistillation and fractionation yields a distillate known as carbolic oil fraction. This, after removal of the carbolic and similar acids, yields "neutral tar oil."

Hydrocarbon Oils—Petroleum.—Petroleum is a naturally oily liquid occurring in the earth, and from which by distillation a number of useful products are obtained. Of these, benzine, gasoline, petrol or petroleum ether are transparent, colourless, volatile fluids, insoluble in water. Applied locally it is doubtful whether they are absorbed, but they cause a lowering of temperature by evaporation and local anaesthesia, and as they are excellent

solvents for fats would act in dissolving fat and removing grease from the skin. "Kerosenes" are also obtained from petroleum, but this group contains many commercial products of very variable purity, and often their physiological action is due to these impurities. If pure they would have an emollient and protective action. From petroleum is also obtained the liquid paraffin of the pharmacopœia. It is a colourless, odourless, tasteless, and transparent oily fluid, and is sold under many trade names. It is used as a dressing for wounds and ulcers, but its beneficial action is probably due more to the exclusion of air than to any other factor.

Residual Hydrocarbon Compounds of Vaseline Type.—Vaseline or petroleum jelly is obtained from crude petroleum after the lubricating oils have been removed by distillation. It is translucent, yellowish in colour, of the consistency of soft soap, and almost tasteless and odourless. It is largely used as a salve and has the great advantage of not becoming rancid.

Wool Fat.—The purified fat or natural grease contained in sheep's wool. It is a light yellow, tenacious, unctuous material with a slight odour. It is insoluble in but is miscible with twice its weight of water. Purified wool fat is used in pharmacy under the name of lanolin. It is emollient, but the claims made that it is very readily absorbed by the skin are doubtful. It has, however, many excellent features as a skin dressing.

Fatty Acids.—These are constituents of natural oils and fats, of which the most important for the purposes under review here is oleic acid. It is a pale brownish-yellow oily liquid and whilst insoluble in water mixes in all proportions with alcohol, chloroform, ether, petroleum ether, turpentine and fixed oils. It is used for dissolving metallic oxides and alkaloids and forming oleates, in which form absorption is said to be greater than is obtained by the use of ointments containing the same active medicaments.

Neutral Fats.—Compounds containing glycerine and fatty acids, occurring naturally, generally of animal origin, and containing no free or uncombined fatty acid. Lard and tallow are important examples of these. These are used as a vehicle with which to utilise active medicaments.

Stearin Pitch.—The residue left after the distillation of the fatty acids produced in certain manufacturing processes, *e.g.*, candle making. The pitch may be soft or hard, according to the volatile matter left in the residue. Probably used for physical reasons only.

Naphthalene.—A hydrocarbon obtained from coal tar which slowly volatilises on exposure to air. It has antiseptic and disinfectant properties and has been used as a parasiticide.

Cresylic Acid and Homologues.—Cresylic acid (creosol) is an active antiseptic and disinfectant obtained from the distillation of coal tar. It surpasses phenol both as germicide and antiseptic, but owing to its sparing solubility is generally employed in the form of a soap solution or emulsion.

Carbolic Acid or Phenol.—Is obtained from the distillation of coal, and ordinarily occurs as small colourless crystals which deliquesce and acquire a pink or reddish tinge in air and light. Has a characteristic odour and

taste and a strong cauterising action on the skin. Possesses antiseptic and disinfectant properties. In dilute solutions of 3 to 4 per cent. it is mildly irritating, but actively anaesthetic and germicidal.

Soaps.—In its widest sense the term "soap" will include all salts of the fatty acids, *i.e.*, combinations of metallic oxide with fatty acid. Ordinarily and in commerce the term is restricted to the mixture of alkaline salts (and water) which is sold as "soap." According to the base used for combining with the fatty acids we differentiate between hard soaps (soda soaps) and soft soaps (potash soap). The fatty raw material for commercial soap may be any animal or vegetable oil or fat. Resin is frequently used in conjunction with fats and oils in the preparation of both hard and soft soaps, forming with the alkali used a resin soap or resinate. Hard soaps usually contain 30 to 35 per cent. water, while soft soaps contain 43 to 48 per cent. water. Hard soap is sparingly soluble in cold water, 1 part requiring 20 parts water. It is entirely soluble in boiling water (1 in 1½). Soft soap is much more soluble in cold water than hard soap, and slightly more soluble in boiling water.

Soap is slightly antacid and is used in the treatment of various skin diseases, not only for its cleansing action but also to soften the horny layer of epidermis. Soap is extensively used as an emulsifying agent for various hydrocarbon oils, &c. Soap in aqueous solution is decomposed by acids, salts of the alkaline earths, and metallic salts. Acids combine with the alkali present in soap and liberate the fatty acids. The salts of the alkaline earths, *e.g.*, lime, decompose the soap liberating the alkali and forming soaps of the alkaline earths which are insoluble in water. In the case of metallic salts, corresponding soaps of the metals are formed. Thus "hard" waters, *i.e.*, those containing salts of calcium (lime) and magnesium in solution, decompose and curdle soap solutions, and a permanent lather is not produced till the lime and magnesia salts present have been precipitated as insoluble soaps. Hard waters may be softened by the use of caustic and/or carbonate of soda suitably applied.

Arsenious Oxide or White Arsenic (Arsenic).—A heavy white compound obtained by roasting certain arsenical ores. When added to water, instead of descending like sand, arsenious oxide partially floats on the surface and even the portion which sinks forms round pellets which are wet on the outside and contain particles of dry oxide inside; hence the necessity for thorough stirring of arsenic solutions. Arsenious acid is soluble in caustic potash or soda, and in solution of sodium carbonate. In sufficient strength, it is capable of destroying the vitality of all forms of living matter, but is too poisonous for use as a general germicide. When applied to the skin denuded of its epidermis it acts as a caustic and produces a slough. If used in a dilute form and over a large surface it may be absorbed and may produce the general effect of the drug on the system. It is used in combination with soda, sulphur and soap in sheep-dips, and in the form of an arsenical soap for treating skins.

Mercury (metallic).—A silver-white metallic-looking fluid readily divisible into globules, and without odour or taste. It is insoluble in ordinary solvents. Metallic mercury in the bulk is not absorbed by the skin, but when it is finely divided absorption takes place. It is used for external application in the form of an ointment, the ointment base being usually lard, and in this form is used advantageously in various forms of eruptive affections and skin diseases. It is an active parasiticide and antiseptic.

Sodium Compounds.—Under this heading sodium hydroxide or caustic soda and sodium carbonate (soda ash) will be discussed. Exposed to the air caustic soda readily absorbs water and carbonic acid and becomes converted into carbonate. It is readily soluble in water. Great caution is required in using caustic soda or its solution on account of its rapid action in attacking and destroying organic tissues. It is a powerful caustic and antacid. Its principal use is in saponifying vegetable and animal oils, and it is also used in combination with arsenious oxide in the production of sodium arsenite. For the production of sodium arsenite in concentrated watery solution, 3¼ oz. (.202 lb.) of caustic soda require to be used for each pound of arsenic to be dissolved, and the minimum quantity of water necessary for the above amounts is approximately 11 pints. If, however, the amount of caustic soda is increased to 6 oz. solution is more readily effected.

Sodium carbonate is commonly used in the form known as washing soda. Washing soda effloresces rapidly in dry air, loses moisture, and may approximate to the composition of soda ash. When washing soda is specified, soda ash should not be used except in equivalent quantities, 2.7 parts by weight of the former being equivalent to 1 part of the latter. Washing soda is a colourless, translucent compound possessing a somewhat caustic taste and an alkaline reaction, is readily soluble in water (5 in 8), and almost insoluble in alcohol. It is strongly alkaline, and is therefore antacid. In dilute aqueous solution it is used as a lotion in the treatment of skin diseases and burns.

Pine Tar.—Pine tar (*Pix Liquida* of the Pharmacopœa) is a bituminous fluid or semi-fluid substance obtained by the destructive distillation of *Pinus sylvestris* and other species of pine. Commercially, it is known as Stockholm tar. It contains guiacol and creosol, and resembles these in its actions, which are those of a local stimulant parasiticide and antiseptic. It is used in forms of skin disease, but it is said that many skins will not tolerate it.

Pine Tar Oil.—Pine tar oil (*Ol. Picis Liquidum,* also *Ol. Pic. Liq. Rectification*) is prepared by distilling wood tar. (Sp. gravity, .892 English, .960 America.) It is specifically lighter than water, has a dark reddish-brown colour and a strong empyreumatic odour and taste. It is soluble in alcohol, and the solution has an acid reaction. The most important constituent is creosote, and its action is similar to that substance. It is used externally in various skin diseases, generally in the form of an emulsion.

The rectified product is specifically lighter than the above (.850); it is colourless or straw coloured when first distilled, but darkens in colour on keeping. Its properties and action are similar to those of pine tar oil.

Oil of pine (*Oleum abietis,* B.P., now replaces *Ol. Pini Sylvestris,* B.P.). It is a volatile oil distilled from fresh leaves of *Abies Siberica,* and is soluble in alcohol (two parts oil dissolve in one part 90 per cent. alcohol). It has stimulating and disinfecting properties, a bitter, pungent taste, and is frequently employed for many purposes for which turpentine is used. A thick tarry oil of high viscosity and very dark in colour, and also obtained from distillation of wood, is found on the American market, and is frequently supplied for "oil of tar." This does not comply with the U.S.A. requirements as to specific gravity, and is usually heavier than water. Its properties, however, are said to be similar,

Copper Sulphate (*Bluestone*).—Copper sulphate occurs as deep blue crystals. Approximately one-third of the weight of these is water of crystallisation, the balance being anhydrous copper sulphate. The commercial copper sulphate is usually of 98½ per cent. purity. Copper sulphate is soluble in water (at ordinary temperate), 1 in 3½, and more readily in boiling water (2 in 1). It is soluble in glycerine (1 in 2½ glycerine), but insoluble in strong alcohol (90 per cent.). Copper sulphate is irritant or mildly exharotic, and when in diluted solution stimulant and astringent. It is used externally as a styptic for bleeding surfaces and a local stimulant in ulcerations, and as an exharotic for warts, &c. Copper sulphate is highly poisonous to certain of the lower forms of vegetable life, and has been found successful in destroying algæ in ponds, &c., in the minute quantity of 1 in 1,000,000, and even 1 in 5,000,000.

HANDLING OF THE FLOCK WHEN BLOWFLIES ARE BAD.

Special care must be taken in the handling of the flock during seasons when fly infestation is bad.

At the yearly classing of the ewe flock all ewes with excessive wrinkles, especially on the hind quarters, should be suitably marked and if possible kept away from the breeding flock. When flies are numerous it is certainly advisable to run all the ewes which may cause trouble because of conformation in a mob by themselves. This flock should be kept in a paddock or paddocks fairly convenient to the yards, so as to obviate unnecessary driving. In fact, during the period the flies are active, small temporary yards in a corner of the paddock in which the sheep are running will save a great deal of unnecessary droving to and from the main yards.

As soon as a sheep is seen to be struck no time should be lost before it is caught and treated, as an affected sheep will attract more flies and other sheep may become blown.

If possible have several shades in each paddock, so that the flock will not have to crowd together when resting during the heat of the day. Adequate water supply should be provided, and if the sheep are watered from troughs

they should be of such length that the sheep have not to wait for an extended period for a drink, as when flies are bad the watering places are localities where they abound.

Rams that have excessive fold development on the hind quarters should not be used, as the fault is often intensified in the progeny.

It is a good plan to keep the hogget ewes in a paddock by themselves, as usually they will be the first to be troubled by flies, and the unnecessary yarding of sheep at any time should be avoided. At lambing time it will be the lambing ewes which will be giving trouble, so they should be kept on their own at this time.

Never leave sheep in the yards any longer than is absolutely necessary when flies are troublesome, as flies are most troublesome at the yards or at any place where numbers of sheep are congregated.

Sheep most liable to attack, ewes and ewe hoggets, should be run in the more open paddocks, where there is more chance of the blown sheep being noticed when the flock is inspected. Inspections for fly should be frequent, and preferably daily when fly is active.

During mating the rams should be counted at each inspection, as when struck behind the horns a ram will often leave the flock and roam about alone. This means that the service of the fly-blown ram is lost at the time that it is most required.

Market Control.

Speaking at the Interstate Conference of Ministers for Agriculture, at Perth, the Hon. W. Forgan Smith, of Queensland, said that in almost every form of industrial activity outside of primary production, organisations of one kind or another are established to prevent fluctuations in prices. Very careful analyses are made by these organisations as to the consuming capacity of a given commodity. An organisation producing carpenters' saws, for instance, can foretell with a fair degree of accuracy the number required by the world's markets in any one year. The same remark applies to motor-cars, machinery, and so on. It would be the duty of this organisation to investigate marketing conditions, the maximum consumption that is likely to take place, and organise the industry accordingly.

In regard to our primary production, little if anything has been done in this direction. The farmer is about the only individual who produces without foreknowledge of the marketing conditions attaching to his product. As a result you have violent fluctuations in prices in the various markets of the world, both in Australia and elsewhere. During the season when Nature is most bounteous you find a glut in the market, and the farmer gets little or nothing in return for his labour. Under other conditions the market is undersupplied, prices are high, and in many cases only a few people can supply that market. As a consequence the result is bad from the farmer's point of view, and from the point of view of the consumer. You have a number of products from which a man can choose, and with orderly marketing you can build up a steady demand for that product, but that demand depends very largely upon continuity of supplies. If there is a surplus at one period, the whole market is disorganised, there is no control of prices, and it is detrimental to the interests of all concerned.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—	
Aussie	J. Parslow, Balladoran.
Canberra	J. Parslow, Balladoran.
Nabawa	Cullen Brothers, Dubbo.
	H. J. Harvey. Dubbo.
Riverina	Cullen Brothers, Dubbo.
Waratah	R. O. Stiles, Narromine.
Yandilla King...	R. O. Stiles, Narromine.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Sunnybrook Earliana ...	A. E. Johnson, Green Valley, via Liverpool.
Japanese Millet	Manager, Experiment Farm, Coonamble.
Sudan Grass	C. Bennett, Forbes Road, Cowra.
Sweet Sorghums—	
White African	Under-Secretary, Department of Agriculture,
Saccaline	Manager, Experiment Farm, Lismore.
	D. P. Shearer and Sons, Glendon, Scott's Flat, Singleton.
Collier	Manager, Experiment Farm, Grafton.
Cowper (late Selection No. 61)	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1929.

Moruya (H. P. Jeffery) ..	Jan.	25, 26
St. Ives (F. Clarke) ..	Feb.	8, 9
Leeton (W. Rosewarn) ..	,,	12, 13
Castle Hill (W. H. Taylor) ..	,,	15, 16
Newcastle (E. J. Dann) ..	,,	19 to 23
Blacktown (A. J. Greenaway) ..	,,	22, 23
Maitland (M. A. Brown) ..	,,	27, 28, Mar. 1, 2
Oberon (C. S. Chudleigh) ..	,,	28, Mar. 1
Moss Vale (W. Holt) ..	,,	28, Mar. 1, 2
Tumut (H. Mount).. ..	Mar.	5, 6
Cessnock (G. Badgery) ..	,,	6 to 9
Campbelltown (W. N. Rudd) ..	,,	8, 9
Rydal (H. Murray) ..	Mar.	8, 9
Gundagai (P. J. Sullivan) ..	,,	12, 13
Mudgee (O. Wilkins) ..	,,	14, 15, 16
Goulburn (T. Higgins) ..	,,	14, 15, 16
Kempsey (E. Mitchell) ..	,,	19, 20, 21
Wallamba (E. A. Carey) ..	,,	21, 22
Wingello (J. E. Creelman) ..	,,	23
Batlow (C. S. Gregory) ..	,,	26, 27
R.A.S., Sydney (G.C. Somerville)	,,	27 to Ap. 6
Orange (G. Williams) ..	April	16, 17, 18
Wingham (D. Stewart) ..	,,	17, 18
Grafton (L. C. Lawson) ..	,,	17 to 20
Ganmain (C. C. Henderson) ..	Sept.	10, 11

Poultry Notes.

December.

E. HADLINGTON, Poultry Expert.

Towards the end of this month a start will be made on most farms to cull out the hens that are finishing their second laying season, *i.e.*, birds about 2½ years old. On farms which are properly managed, and where the birds are fed correctly, there should be no necessity for a wholesale culling. During this month the extent of the culling required should be governed by the condition of the flock generally, and the number of eggs being laid. For instance, if many of the birds are showing signs of moulting freely and the combs are drying up, it is no use keeping them any longer, or if through no fault in management the egg production has fallen much below 50 per cent., some reduction in the number of hens is advisable. The question as to which birds should be eliminated is one that troubles the beginner in poultry farming and for this reason it is considered appropriate to deal with the whole matter of culling and the selection of layers generally.

Measurement Tests.

Many inexperienced poultry farmers when culling out the hens resort to some "measurement test" as the sole means of picking out the bad from the good layers. The result is that many which should be kept are sent to market, and others which should go out are retained.

In connection with such tests, it must be understood that when a hen or pullet is in full lay the whole abdomen is expanded, the pelvic bones are wide apart, and the skin is soft. When not laying there is a general contraction of these parts, and the pelvic bones may be quite close together. From this it may be thought that to cull the non-layers is simplicity itself, but there are other factors to be considered.

In the case of hens it must be borne in mind that for various reasons some may cease, temporarily, to lay and if tested at that time by the means just mentioned would be rejected. Yet the same hens if kept would come on to lay again and probably be as profitable as the rest of the flock. This applies particularly to the heavy breeds in the summer months when broodiness is prevalent. The pelvic bones of those birds which have been broody will be closed until they come on to lay again; thus, if culling were done by pelvic measurement alone, such hens would more than likely be rejected as bad layers, or as having ceased laying for the season. That this mistake is often made is apparent from the number of hens seen in the markets early in the summer which look as if they would soon come on to lay again. Therefore, it will be seen that whilst the width apart of pelvic bones is an indication as to whether a bird is actually laying or not, by itself it is not a reliable guide in deciding when a bird has finished laying.

Points in Culling.

When it has been decided that culling is necessary among the 2½-year-hens, the procedure to be adopted is as follows. The birds are best closed in the house, and a preliminary selection made by picking out those which exhibit signs of drying up in the comb, or show indications of a moult. If, upon close inspection, it is seen that the comb has commenced to contract and become somewhat stiff there is little doubt that laying has finished, and a moult is most likely to result, in which case it is no use keeping such birds any longer.

Some hens may have commenced to moult and are still laying, and it is in such cases that the condition of the pelvic bones will remove any doubt. If the bones are wide apart, the abdomen expanded, and the skin pliable, there is a good chance that the birds will continue to lay through the moult, and consequently pay for their keep. If, on the other hand, a moult has commenced and the bones are quite close together, with a general contraction of the abdomen, such birds should be marketed.

General Culling.

Apart from culling out the hens that are finishing their second laying season, some thinning out may be necessary among the first year hens, and to a lesser extent among the pullets after they have reached the laying age.

With regard to the first year birds, probably 5 to 8 per cent. is all that will require to be eliminated in a large flock. These would be the very early moulters—those which fall into moult, say, in December or early January—and others lacking in physique and which have gone off laying, as well as those which are not likely to pay to keep for another season owing to their being poor layers.

Among the pullets, if they have been properly reared, there should be very few which it will not pay to keep for the first season's laying. As a matter of fact, less than 5 per cent. should require to be marketed, and no attempt to cull should be made until they are at least six months old. It is in culling out the first year hens and pullets that judgment and a knowledge of selection are necessary, and a few hints on the subject will no doubt be welcomed by the beginner.

Methods of Selection.

Much has been written about anatomical methods of selecting layers, such as previously mentioned, and many poultry farmers have been misled because all factors have not been explained. However, it is not intended to condemn such systems as worthless, but merely to show that they have their limitations and that experience and judgment are necessary in their application. For instance, some exponents of these methods would reject all birds which show a tendency to thickness of pelvic bones, yet one has only to handle many of the birds that have put up high records in laying competitions to be convinced that this factor can be stressed too much. On the other hand, birds that are coarse boned as well as having thick, gristly pelvic bones are not likely to be good layers.

Selection of layers can be carried out to a limited extent by trap-nesting and single-pen testing, but obviously only a small number of birds can be dealt with in these ways, owing to the expense and the labour involved. Such means may be practicable for stud breeders who have to meet a certain demand for tested stock, but for commercial farms some more expeditious system is required to eliminate the drones from the workers.

A Good Layer.
Showing head of White Leghorn hen which laid 228 eggs in 365 days.

A Bad Layer.
Showing head of a hen which laid 10 eggs in 365 days.

Conformation of the Head.

Certain points of the head of a hen are more reliable guides to productiveness than any other system known, and a study of these characteristics will enable anyone who has ordinary aptitude for poultry farming to

eliminate the unprofitable birds from the flock. The accompanying illustrations will serve to demonstrate the points which are described below.

One of the first considerations in looking for the good layer is the eye. It should be large, bright, and stand out prominently, which means that in looking straight down the beak of the bird the eye should stand out from

A Good Layer.
Showing head of a Black Orpington hen which laid 337 eggs in 365 days.

A Bad Layer.
Showing head of Black Orpington hen which laid 71 eggs in 365 days.

the face. In the bad layers the eyebrows will be found to overhang the eyes, giving them the appearance of being sunken into the head.

Next comes the skull. The high producer has a fine skull, giving the bird an active, alert appearance as compared with the poor layer, which is broad across the top of the skull, and thick above the eyes, giving the impression of laziness and inactivity.

The face is another factor of much importance in choosing the layer. Freedom from wrinkles and feathering is essential. The face should be somewhat long, and deep, but, withal, well proportioned.

Texture of comb and wattles, together with thickness, must also be taken into consideration. In the case of a good layer the texture will be fairly fine, and the comb not unduly thick and heavy; whereas the poor layer shows a rough-grained comb and wattles, the comb being much thicker than that of the average bird, giving a general appearance of coarseness. This does not mean that one should choose birds with extremely thin combs, showing the smoothness of glass, because these are sometimes indications of weakness.

Conformation of the Body.

The conformation of the body is also an indication of capacity, and good depth as judged by the distance from the top of the back to underneath the body between the legs is what one looks for in the good layer. This, together with the width across the back, denotes capacity to lay, and shows a strong constitution. In judging this feature, however, the breed type has to be kept in mind. For instance, one would not look for the same width of back, or depth in a leghorn as in a black orpington.

Another factor, too, which will be observed in the good layer is that the skin of the abdomen is soft and pliable, particularly when she is in laying condition, but the low producer will be found to have a much coarser and thicker skin.

By studying the foregoing characteristics it is quite an easy matter to pick out at a glance the poor layers, but, of course, selecting the highest producers requires a more careful examination and calls for greater skill.

Top-dressing of Pastures in New Zealand.

Reporting to the Australian Dairy Council on their visit to New Zealand for the purpose of surveying the dairy industry in that country, Messrs. J. Proud, President of the Federal Council of the Australian Dairy Factory Managers and Secretaries' Association, and A. E. Sweaney, Manager and Secretary of the Inverell Co-operative Butter and Bacon Co., state in regard to top-dressing of pastures:—

There is no doubt the basis of the great wealth of the Dominion lies in the scientific management of the pastures. From these an almost incredible return is yielded, due to top-dressing. In general, the country was, in its virgin state, of very poor character. Thousands of acres possess but a few inches of soil on poor pumice formation, and on this originally grew ti-tree and bracken fern. Nothing could be more uninviting. These conditions also obtained in the famous Waikato district, where as late as twenty years ago land could not be sold for £1 per acre. Now such land could not be bought for less than £50 per acre, the returns being so phenomenal. This transformation has been effected by the application of fertilisers in the form of top-dressing, which has clothed the land in excellent permanent pastures.

Orchard Notes.

December.

C. G. SAVAGE AND H. BROADFOOT.

Codling Moth.

SPRAYING, if not done thoroughly, represents wasted money and time. It is an operation the value of which depends upon the efficiency with which it is carried out. In spraying apple, pear, and quince trees for codling moth, the spray nozzle should be directed over all parts of the trees, and care should be taken to ensure that each individual fruit receives a coating of lead arsenate. Be sure to provide a hose long enough to treat thoroughly even the largest of the trees.

Among the many important points to which the orchardist has to give consideration at this time of the year, two stand out prominently. One is to keep a strict watch upon all possible sources of infestation, and the other is to take such steps as will minimise possible losses. Among the sources of infestation that may prove very serious if treated lightly is the use of second-hand cases, which frequently carry grubs far and wide. That there is a big risk involved in using such cases can frequently be demonstrated by knocking to pieces a second-hand case, when careful examination will prove that it has carried grubs. Naturally these form a potential source of infestation and nullify even the most earnest and arduous efforts of the grower, who, in other directions works untiringly and energetically to control orchard pests. Immersing second-hand cases in boiling water for three minutes will kill any grubs harbouring in the case joints.

Possible losses by actual infestation may be countered to some extent by early picking of codling moth infested fruit. It is earnestly to be hoped that growers will realise this and act accordingly. By following this practice systematically, great numbers of grubs are destroyed and losses are minimised. There is promise this season of a light crop of apples, and this gives growers an excellent opportunity of profiting by early picking. Another precaution is to pick up fallen fruit regularly, and to boil or burn it whilst still infested. To gather such fruit and to let it remain until the grub has escaped is the height of folly, and renders the grower liable for contravention of the regulations under the Plant Diseases Act.

Apple Leaf Jassid.

By attacking the leaves of apple trees and extracting their sap, the apple leaf jassid often causes the leaf to shrivel and to cease functioning. If the infestation is serious, the results are serious, especially if the tree is carrying a heavy crop of fruit. To the health of the tree, to its development, and to its fruitfulness, it is essential that the leaves should carry on unchecked their vital processes. The apple leaf jassid, too, depreciates the

value and appearance of the fruit by excremental deposits. To keep the pest in check (a necessity which most growers recognise) a nicotine extract is very efficacious.

Pear and Cherry Slug.

If not checked this pest will do much damage. Fortunately it is easily controlled. The pear and cherry slug attacks the leaves of pear and cherry trees, and consequently the elaboration of raw food material into organised food material is interfered with, resulting in injury to the current crop. as well as to that following. Spraying the trees with lead arsenate is the most efficacious way of keeping this pest in check.

Fruit Fly.

This is a pest against which it is necessary to wage strenuous warfare. Spasmodic and limited action is useless. The warfare should be district-wide and vigorous. As in the case of the codling moth, fallen fruit should be picked up at intervals and boiled or burnt. Growers fortunate enough to carry on their work in districts that are fruit fly free should do all they can to preserve this immunity.

Cultivation.

Unless good cultural methods are adopted, it is not possible to produce continually good quality fruit. The vital processes involved in the development and maturity of a heavy crop of quality fruit constitute a severe strain upon a tree. It is, therefore, essential that soil moisture be conserved, to which end weed growth should be checked, and a good soil mulch maintained. If these points are not attended to, moisture is lost by transpiration and by evaporation from the soil surface. Large areas can now be worked rapidly and effectively by modern implements, and there is little excuse for the fruit-grower who allows his orchard to get into such a condition that the much-needed moisture is lost.

Drying Apricots.

If first-class fruit is desired, apricots intended for drying must be allowed to remain upon the tree until fully ripe, but not overripe. As it is necessary to pick this fairly soft fruit carefully, it will be essential to go over the trees several times, because—it hardly seems necessary to mention this point—the fruit does not all reach the proper stage of ripeness at the same time.

Although the apricot splits easily, it should be cut, not pulled, in halves, and it should then be placed in trays with the cup-side upwards, the pits, of course, first having been removed. Each tray is placed in the fumigator with as little delay as possible, and is allowed to remain there until the fumigator is sufficiently full to start the sulphur burning. This is of great importance, because once the fruit has been halved it must not be exposed to sun or wind, otherwise such exposure will detract from its appearance. Sulphur at the rate of 1 lb. to 200 cubic feet of room space should be placed in the burner. The fruit should be allowed to remain in the fumigator from eight to ten or twelve hours, or until the cup is full

of juice. The trays of fruit should then be carried from the fumigator to the drying ground, which must be available if the sun is the only or principal drying agent. The ground should be laid out and utilised in such a manner that the fruit may be carried on trucks to any part of it, and it should be kept as free from dust as possible. The dust nuisance may be minimised by leaving no tracks or spaces between the trays. There are then only outside trays to be watched, and borders and paths (if any) can be sprinkled with water.

The bulletin on "Fruit Drying" issued by the Department of Agriculture, and obtainable either from that Department, or from the Government Printer, Sydney, for the small charge of 10d. (posted), will prove of value to growers who wish to dry fruit.

Marketing.

As large consignments of stone fruit will soon be marketed, it is of great importance that growers should pay attention to sizing, grading, and packing. Fruit should be picked when it is mature, but still firm, and unless growers pay attention to this point—seeing that fruit continues to mature from time of picking until it is consumed—it is plain that it has little chance of reaching the consumer in anything like good condition. Bruised, overripe fruit, of any kind, especially stone fruits, cannot be sold at prices satisfactory to the grower. Cases should not be packed too high or have the contents too forcibly squeezed into them, and unless the fruit skin is kept absolutely unbroken, the fruit will not maintain excellent condition.

Irrigation.

Where irrigation is practised, care should be taken to soak the subsoil thoroughly, and to confine the water to furrows. The cultivator should be started as soon as the surface is dry enough and then kept going. Do not over-water, and do not under-cultivate are golden rules.

Drainage.

During summer heavy rain storms sometimes carry away much soil unless adequate provision for carrying off storm water has been made. Surface drains should be kept clear. Conservation of soil involves less time and expense than renewal.

In the crop experiment work, although very valuable results are derived from the trials conducted by the agricultural instructors on private farms, where attention to detail is necessary and continuity is essential the field experiments can only be satisfactorily carried out at experiment farms. These experiments aim at determining the best cultural methods to employ and fertilisers to use, the proper rate and time of seeding, the most suitable crop rotations and varieties, the most effective treatment of seed for disease control, and all other factors affecting yield. Some indication of the number and variety of experiments is to be had from the fact that although the area of each plot is, as a rule, only about one-tenth of an acre, over 100 acres are devoted to crop experiments at some of the Departmental farms.

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INDEX

To Vol. XXXIX, 1928.

SUBJECT INDEX.

INDEX, 1928

INDEX, 1928.

INDEX, 1928.

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AUTHOR INDEX.

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